

EXHIBIT 28

RCI Environmental, Inc.Rhône Poulenc Site Remediation
9229 East Marginal Way South
Tukwila, WA 98108Phone: 253-863-5200
Fax: 253-859-5702**SUBMITTAL**

LOG NUMBER: 617

REV.: 000

TO: URS10501 4th Ave., Suite 1400
Seattle, WA 98101-1616Phone: (206) 438-2700
Fax: (206) 438-2699**URS#: 33749380****RCI #: 623E****PROJECT: Rhône Poulenc Site Remediation****SUBMITTAL ITEM DESCRIPTION****SUBMITTAL No. SPEC SECTION***ELECTRICAL SUBMITTALS*Vendor: *BETSCITART ELEC/MOTORS & CONTROLS CORP*

Revision	Specification and Paragraphs	Sent to SPB	Copies	Status
000	16050			NEW

Notes to Reviewer:

RCI has reviewed the attached submittal data and confirms that the information is in compliance with the project plans and specifications. *Rev 7/26*

RCI has reviewed the attached submittal data and finds that the information is not precisely as specified. Please find the attached or above explanation for this deviation in, "Notes to Reviewer". _____

This submittal is transmitted by: *Robison Construction, Inc.*Initial: *Rev 7/26*

Robison Construction, Inc.

**BETSCHART ELECTRIC
CO., INC.**

ELECTRICAL SUBMITTALS

FOR

RHONE POULENC SITE

GENERAL CONTRACTOR

RCI CONSTRUCTION

1216 140TH AVE. CT E.

SUMNER, WA 98390

ELECTRICAL CONTRACTOR

Betschart Electric Company, Incorporated

500 S.E. CHERRY

OLYMPIA, WA 98501

TEL. (360)943-4545

ELECTRICAL SUPPLIER

MOTORS & CONTROLS CORPORATION

430 CARPENTER RD. SE

OLYMPIA, WA 98503

TEL. (360)438-3447



QUOTATION

**Motors & Controls Corporation
430 Carpenter Rd SE
Olympia, WA 98503
360-438-3447
Fax 360-459-5993**

Send to: Betschart Electric	From: Brian Friedle
Attention: Mardy	Date: February 18, 2003
Phone:	Quotation Number:
Fax: 360-943-4767	

Qty	Description	Price	Availability
1	PLC Control panel per supplied Drawing#13 to include the following: Hammond Nema4/12 enclosure Siemens S7-314 series PLC Siemens OP-27 Operator Panel Dell laptop computer Honeywell Trendview Data recorder Raco Verbatim VSS-8C Auto dialer Terminals, Relays, Power Supplies, Wireway, etc, as shown on drawing. ETI listing to UL 508 standard Field Installation by others	\$31,000	10-12 weeks

INDEX



BETSCHART ELECTRIC-RCI

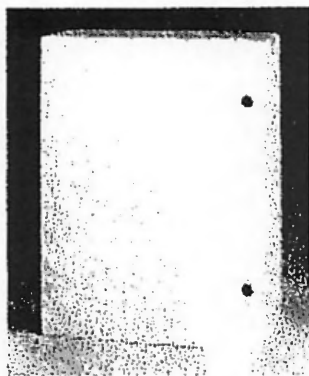
Qty	Description	Mfg	SECTION
1	EN4SD483616GY NEMA-4/12 ENCLOSURE	HAMMOND	A
1	EP4836 BACKPANEL FOR ENCLOSURE	HAMMOND	A
1	SKT011419NO THERMOSTAT N.O. FOR COOLING FAN	HAMMOND	A
1	PF5000 COOLING FILTER FAN W/EXHAUST FILTER	HAMMOND	A
1	L7-10/1/C CIRCUIT BREAKER 1POLE 10AMP	SPRECHER+SCHUH	A
	V7-W4 DIN MOUNT 30AMP TERMINAL quantity as required	SPRECHER+SCHUH	A
8	V7-H6 DIN MOUNT FUSE BLOCK	SPRECHER+SCHUH	A
1	PS5R-E24 100WATT 24VDC POWER SUPPLY	IDEC	A
3	RH2BUL-AC120V DPDT RELAY LIGHTED	IDEC	A
3	SH2B-05 RELAY SOCKET	IDEC	A
1	VERBATIM series-VSS AUTODIALER	RACO	B
1	TVMI-40-00-M00-E00-F10-0U0U0P-00 TRENDVIEW MINITREND RECORDER	HONEYWELL	C
1	OP27 HMI OPERATOR PANEL	SIEMENS	D
1	SIMATIC PRO TOOL PROGRAMMING SOFTWARE FOR OPERATOR PANEL	SIEMENS	D
1	#6ES7 314-1AE04-01B0 CPU 314 CENTRAL PROCESSOR	SIEMENS	E
1	#6ES7 307-1EA00-0AA0 POWER SUPPLY 5AMP	SIEMENS	E
1	#6ES7 307-1EL01-0AA0 120VAC 32PT INPUT	SIEMENS	E
1	#6ES7 322-1EH01-0AA0 120VAC 16PT OUTPUT	SIEMENS	E
1	#6ES7 322-1HH00-0AA0 RELAY OUTPUT	SIEMENS	E
1	#6ES7 331-7KF01-0AB0 ANALOG INPUT	SIEMENS	E
1	#6ES7-332-5HD01-0AB0 ANALOG OUTPUT	SIEMENS	E
1	STEP-7 SOFTWARE	SIEMENS	E

SECTION A

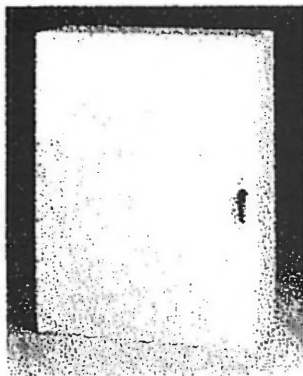
Eclipse Series - NEMA 4, 12

Single Door Endlosures

Industrial Enclosures
Wallmount Enclosures



Single Door with quarter turns



Single Door with 3 point latching handle

Order
Panel
Separately



Application

- Designed to enclose electrical and/or electronic equipment and protect against harsh, industrial environments for wallmount applications.
- Impressive styling features like hidden hinges, attractive latching systems make the Eclipse a suitable addition to any high-tech equipment installation.
- A wide range of sizes and practical accessories make this product line a complete package.
- For high temperature applications, a gasket retainer may be required, please refer to factory.

Standards

- UL 508 Type 3R, 4, 12 and 13
- CSA Type 3R, 4, 12 and 13
- Complies with:
 - NEMA Type 3R, 4, 12 and 13
 - IEC 529, IP65

Construction

- Formed 14 or 16 gauge steel.
- Smooth, continuously welded seams ground smooth.
- Door stiffeners are provided where required for increased strength and rigidity - designed to also permit additional mounting options.
- Formed lip on enclosure to exclude flowing liquids and contaminants.
- Door latches feature the added safety of quarter turn slot requiring use of tool for opening.
- Doors may be easily removed for modifications and are interchangeable.
- Oil resistant gaskets are permanently secured.
- Collar studs provided for mounting inner panel.
- Includes hardware kit with panel mounting nuts and sealing washers for wall mounting holes.
- Bonding stud provided on door and grounding stud installed in enclosure.
- Hinges are constructed from 304 stainless steel.
- Hinge pins are stainless steel.
- Quarter turn latches formed from mild steel diecast key lockable handle with black epoxy finish on 3 point latch.

Finish

- Cover and enclosure are finished in recoatable smooth ANSI/ASA 61 gray powder coating.

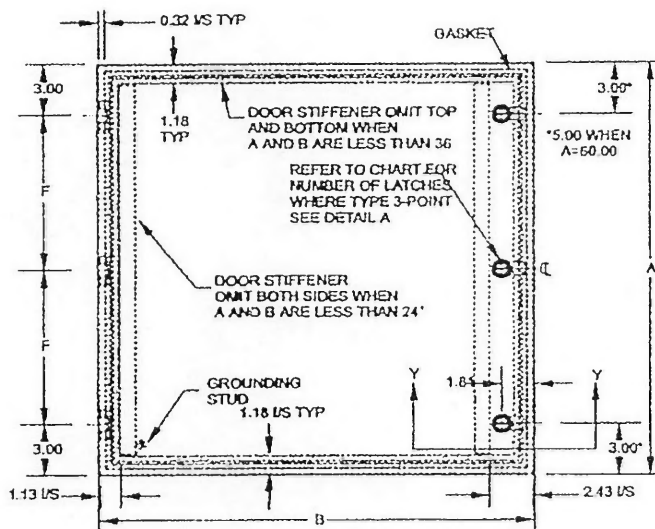
Accessories

- Air conditioners...see page 348-357
- Blowers...see page 359
- Breather kits...see page 374
- DIN rails...see page 35
- DIN rail mounting kit...see page 35
- Door stop kit...see page 393
- Filter fans...see page 360-367
- Heaters...see page 369-371
- Handles...see page 36
- Inner panel...see page 34
- Quarter turn inserts and keys...see page 36
- Literature pocket...see page 397
- Mounting foot kit...see page 36
- Swing panel...see page 35
- Swing frame...see page 34
- Replacement hinge pins...see page 34
- Replacement quarter turn assemblies...see page 36
- Thermostats...see page 374
- Touch up paint...see page 396
- UL/CSA approved hardware kit...see page 382
- Padlock Adapter (EPA)...see page 382

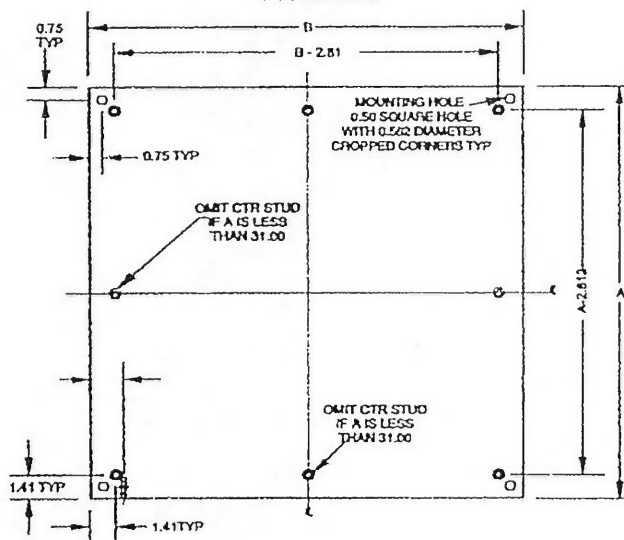
Eclipse Series - NEMA 4, 12

Single Door Endosures

Industrial Enclosures

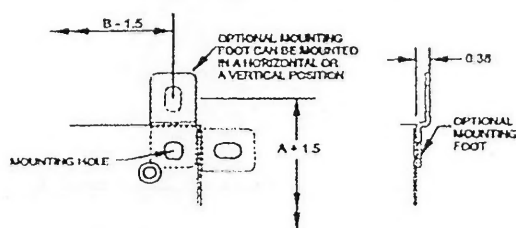


Front View



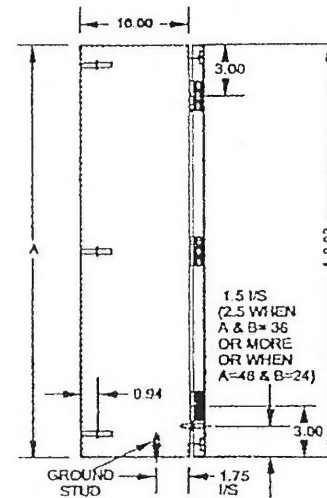
Front Section

(Door and Body Flange removed)



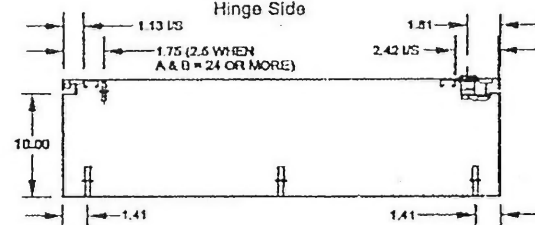
Mounting Detail

Door & Body Flange Removed

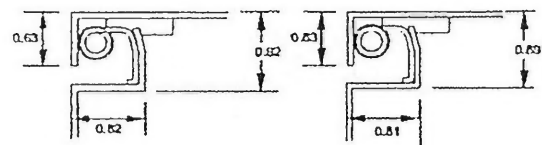


Side View

Hinge Side

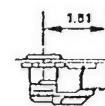


End View

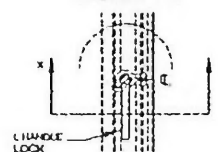


Cross Section of 14 Gauge Body & Door

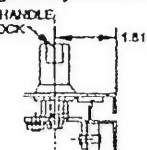
Cross Section of 16 Gauge Body & Door



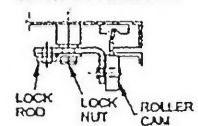
Quarter Turn Lock
Section Y-Y



Detail A



L Handle
Lock Section X-X



**Cross Section Through
End View**
Door Cam Typ 2 pls when
L handle is used

Refer to part number and dimension chart on previous page

Technical references and DXF downloads available at www.hamnfg.com

All dimensions in inches unless specified otherwise

Eclipse Series - NEMA 4, 12

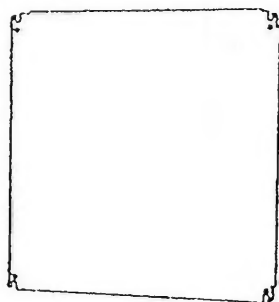
Single Door Endosures

Continued from previous page.

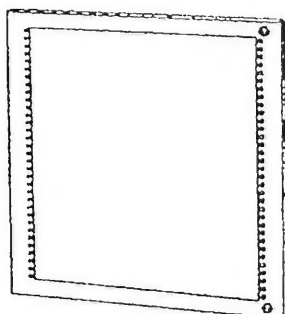
Part No.	Overall Dimensions			Door/Body Gauge	Latches Qty	Type	Opt. Panel Part No.	Panel Size		# Hinges	F	Shlp Wt. lbs.
	A	B	C					D	E			
EN4SD363612GY	36	36	12	14	2	Qtr Turn	EP3636	34.2	34.2	3	15	104
EN4SD423612GY	42	36	12	14	1	3-point	EP4236	40.2	34.2	4	12	121
EN4SD482412GY	48	24	12	14	1	3-point	EP4824	46.2	22.2	4	14	98
EN4SD483612GY	48	36	12	14	1	3-point	EP4836	46.2	34.2	4	14	148
EN4SD603612GY	60	36	12	14	1	3-point	EP6036	58.2	34.2	4	18	165
EN4SD242416GY	24	24	16	14	2	Qtr Turn	EP2424	22.2	22.2	2	18	66
EN4SD363016GY	36	30	16	14	2	Qtr Turn	EP3630	34.2	28.2	3	15	102
EN4SD483616GY	48	36	16	14	1	3-point	EP4836	46.2	34.2	4	14	148
EN4SD242420GY	24	24	20	14	2	Qtr Turn	EP2424	22.2	22.2	2	18	70
EN4SD302420GY	30	24	20	14	2	Qtr Turn	EP3024	28.2	22.2	3	12	82
EN4SD363020GY	36	30	20	14	2	Qtr Turn	EP3630	34.2	28.2	3	15	117

Refer to drawing on following page

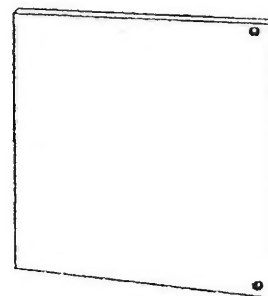
Optional Accessories



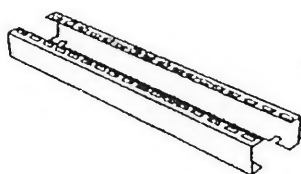
Inner panel...see page 34



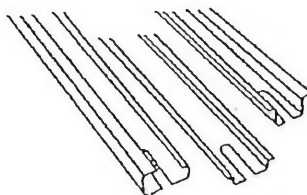
Swing frame...see page 34



Swing panel...see page 35



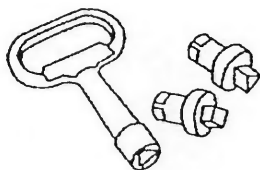
DIN rail mounting kit...see page 35



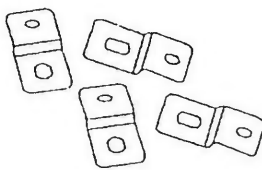
DIN rails...see page 35



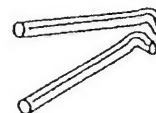
Handles...see page 36



Quarter turn inserts and keys...see page 36



Mounting foot kit...see page 36



Replacement hinge pins...see page 34

Technical references and DXF downloads available at www.hammfg.com

All dimensions in inches unless specified otherwise

Quality Endosures. Service Excellence.

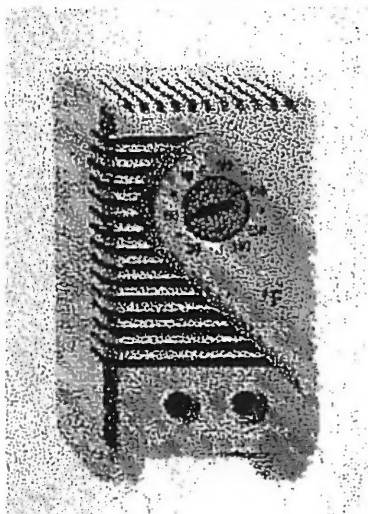
© Hammond Manufacturing

Canada: 519.822.2960 or 905.456.3770 USA: 716.631.8281

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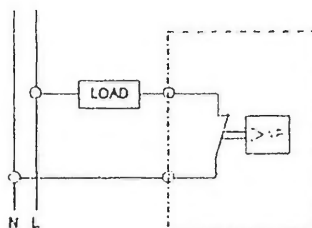
Industrial Enclosures
Wallmount Enclosures

Heating Products

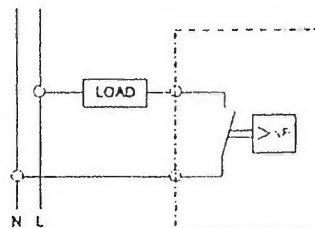


Thermostat

- Designed to provide air temperature control and monitoring in cabinets.
- Thermostat NC (Normally Closed) for the control of heaters and heater fans.
- Thermostat NO (Normally Open) for the control of cooling units, or for switching signal transmitters in case of overheating.
- Available in Fahrenheit or Celsius.



NC - Normally Closed (Red)
Used in conjunction with heaters.
Contact opens when rising temperatures reach the set point temperature shutting heater off.

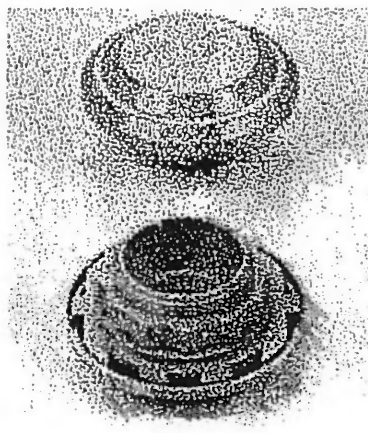


NO - Normally Open (Blue)
Used in conjunction with fans.
Contact closes when rising temperatures reach the set point temperature turning fan on.

Sensor Element:	Thermostatic bi-metal
Switching difference (hysteresis):	±4°F (±3°K)
Adjustment Range:	30-140°F
Noise Suppression:	N (according to VDE 0875)
Connection:	2 pole terminal for AWG 14 (2.5mm ²)
Mounting:	Easily installed by clip mounting on 35 mm or 38 mm DIN rails (included)
Housing:	Flame retardant plastic UL94VO
Color:	Gray (SB)
Protection:	IP30
Approval:	UL Recognized Component, cUL Recognized Component, CE

Part No.	Scale	Contact Type	Dimensions Height x Width x Depth	Switching Capacity	Ship Wt. lbs
SKT011409NC	°F	Normally Closed	2.4 x 1.3 x 1.4	15 A (1) AC 120 V, 10 A (1) AC 250 V	1
SKT011409NC-C	°C	Normally Closed	2.4 x 1.3 x 1.4	15 A (1) AC 120 V, 10 A (1) AC 250 V	1
SKT011419NO	°F	Normally Open	2.4 x 1.3 x 1.4	15 A (1) AC 120 V, 10 A (1) AC 250 V	1
SKT011419NO-C	°C	Normally Open	2.4 x 1.3 x 1.4	15 A (1) AC 120 V, 10 A (1) AC 250 V	1

Climate Control Products
Control Devices



Breather Kit (Pressure Compensation Plug)

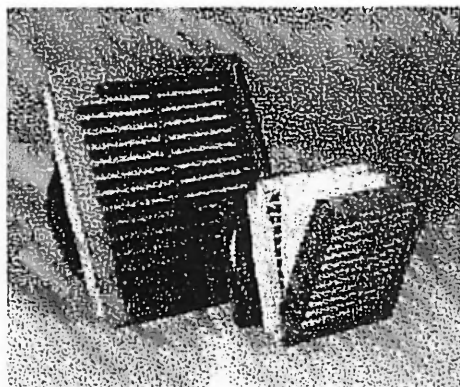
- Packaged individually.
- Provides for controlled pressure compensation due to temperature variations (i.e. night/day operation).
- Recommend two plugs per cabinet in opposite locations.
- Minimum cutout diameter 1.46"



Mounting:	PG 29 (1.14") thread with union nut, minimum cutout diameter
Material:	Polycarbonate UL94VO
Protection:	IP45
Color:	RAL 7032 beige

Part No.	Dimensions (Diameter x Depth)	Ship Wt. lbs
SDA412	2.6" x 1.2"	1

PF Filter Fans



PF3000 and PF2000



Description

- This line of fans provides innovative technology for fan cooling and pressurizing of industrial cabinets. A high quality filter fan provides an economical method of ensuring your enclosure does not overheat.
- Filtered passive ventilation can be provided by an exhaust filter for either convection cooling or in combination with a fan in forced air cooling.
- The slim-line design of this fan line is unique, when installed, the front louvered grill protrudes less than one quarter inch. The attractive grill maintains the sleek aesthetics of an enclosure system.

Standards

- UR, CUR and CE.
- Built to IP54 standards (except PF1000/PFA1000 - IP43 standards).
- Maintains NEMA 12 integrity of enclosure

Features

- Available in 115V and 230V versions
- High performance fan motors with finger guards.
- ABS-FR grills (except PF1000 Series which is polystyrene FR).
- Durable, reusable filter mat.
- Grills are black allowing for a complementary match to all cabinet colors.
- Integral gasket to seal against enclosure. (except PF1000 - use PFG1000)

Easy Installation

- The patented "Click and Fit" system allows for rapid filter fan and exhaust filter installation without screws.
- After using the convenient cutout template (provided with every unit), the fan and/or exhaust filter just snaps into the opening.

Accessories

- Exhaust filters...see page 362
- Replacement grills...see page 362
- Replacement filters...see page 362

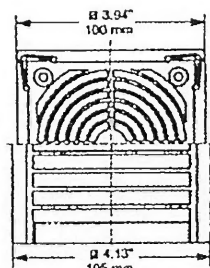
Climate Control Products
Filter Fans

Part No.	Voltage	Free Flow Air Delivery (CFM)	Air Delivery w/Exhaust (CFM)	Max. Static Pressure (Pa)	Filter Density (g/m ³)	Filtering Level (dB)	Sound Level (dB)	Connector Type	Ambient Temp. °F Max/Min	Comparable IP Standard	Ship Wt. lbs
PF1000	115	16	10	29	150	73%	39	2 - 12" wires	140/14	IP43	3
PF2000	115	38	28	69	150	73%	49	terminal strip	122/14	IP54	5
PF2500	115	89	62	57	150	73%	55	terminal strip	122/14	IP54	7
PF3000	115	169	142	89	150	73%	55	terminal strip	122/14	IP54	10
PF5000	115	324	249	205	150	73%	69	terminal strip	122/14	IP54	15
PF6000	115	410	295	225	150	73%	71	terminal strip	122/14	IP54	15
PF1000230	230	16	10	29	150	73%	39	2 - 12" wires	140/14	IP43	3
PF2000230	230	38	28	69	150	73%	49	terminal strip	122/14	IP54	5
PF2500230	230	89	62	57	150	73%	55	terminal strip	122/14	IP54	7
PF3000230	230	169	142	89	150	73%	55	terminal strip	122/14	IP54	10
PF5000230	230	324	249	205	150	73%	69	terminal strip	122/14	IP54	15
PF6000230	230	410	295	225	150	73%	71	terminal strip	122/14	IP54	15

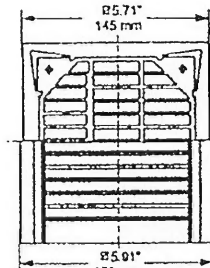
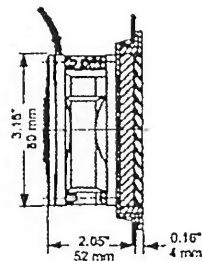
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All dimensions in inches unless specified otherwise

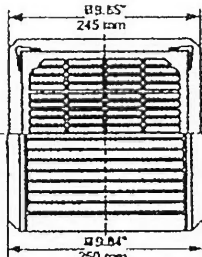
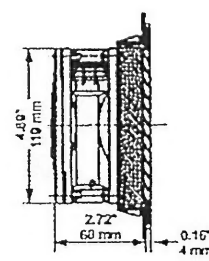
PF Filter Fans



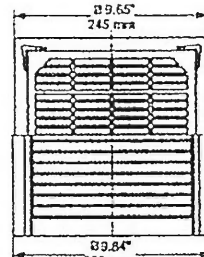
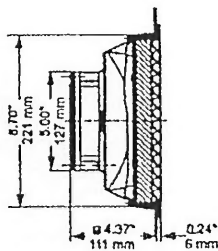
PF1000



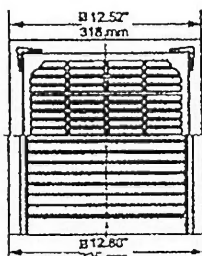
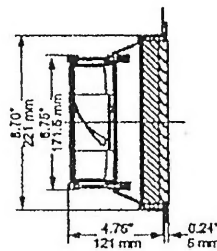
PF2000



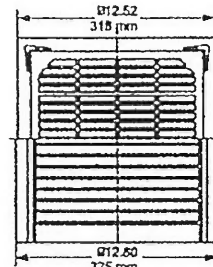
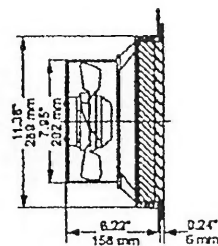
PF2500



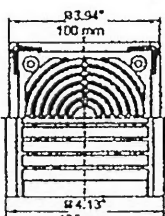
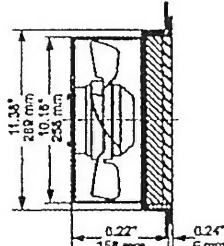
PF3000



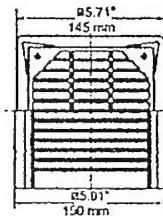
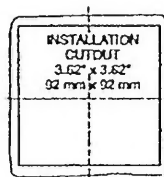
PF5000



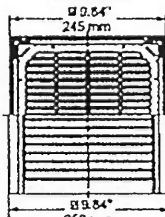
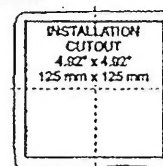
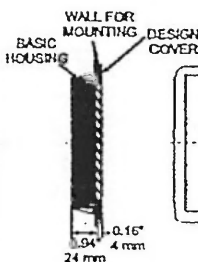
PF6000



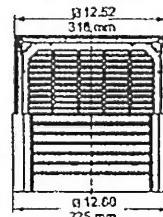
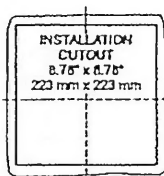
PFA1000



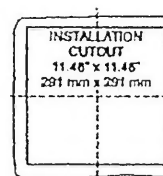
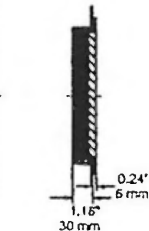
PFA2000



PFA3000



PFA5000



Note: All cutout tolerances +1/- 0 mm

Technical references and DXF downloads available at www.hammfg.com

All dimensions in inches unless specified otherwise

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Filter Fans

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Data Subject to change without notice

Series L7 Miniature Circuit Breakers from F&G

Supplemental short
circuit protection for a
variety of applications

F&G Series L7 Miniature Circuit Breakers provide supplemental overcurrent protection for control circuits, solenoids, actuators, appliances, business equipment and a range of other applications where a high performance current limiting device is required. Advanced features and global approvals make them ideal for use in equipment installed throughout the world.

Broad product range

Series L7 Mini-CBs are available in up to 20 different current ratings from 0.5A to 63A, in one, two and three pole configurations. Over 180 base models are available with a full compliment of accessories.

Devices can be used in applications up to 480V AC and 48V DC with interrupting capacities up to 10kA.

Safety features provide enhanced protection

The terminals of Series L7 Mini-CBs provide IP20 protection to guard against accidental contact with live parts.

To aid troubleshooting, a color-coded indicator provides positive visual indication of the device status (green for OFF, red for ON) and isolation function.

F&G MCBs also incorporate a trip-free mechanism - ensuring that the device operation cannot be defeated by holding the operator in the ON position.

Easy installation

F&G Miniature Circuit Breakers mount on a standard 35mm DIN-rail. Wire terminals accept multiple conductors, and bus bars can be used to quickly distribute power to many Mini-CBs simultaneously. In addition, power to the circuit breakers can be fed from the line or load side.

Global approvals for world- wide acceptance

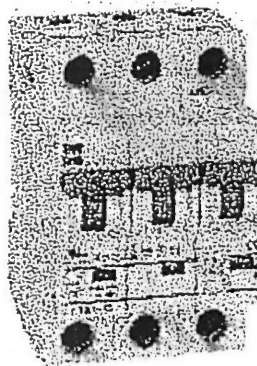
Series L7 Mini-CBs are UL Recognized for use in the United States in accordance with NFPA 79 (NEC, National Electrical Code). The devices comply with UL 1077, meeting the requirements for supplementary protectors intended for use as overcurrent protection where branch circuit protection is not required, or is provided by another device such as a fuse or molded case circuit breaker. These Mini-CBs also comply with IEC 60898 for use in commercial and residential applications and are CE marked.



17.5mm
(1.118")
One Pole



35mm
(1.378")
Two Pole



52.5mm
(2.067")
Three Pole

Three trip characteristics

All F&G L7 Mini-CBs are available with three different tripping characteristics, Type "B", "C", and "D". The tripping characteristic defines the device's speed of response (trip-time) to various levels of overcurrent. Figure 1 shows trip-time versus overcurrent for Type B, C, and D devices. The time-current characteristics enable the device to be optimally matched to the application. For example, PLC outputs that can only tolerate minimal overcurrents are best protected by Mini-CBs with Type B trip characteristics.

F&G L7 circuit breakers are also current limiting - interrupting fault currents within one half cycle. Current limiting devices protect circuit components from damage by reducing the peak let-through current which causes damaging magnetic forces and let-through energy which generates heat.

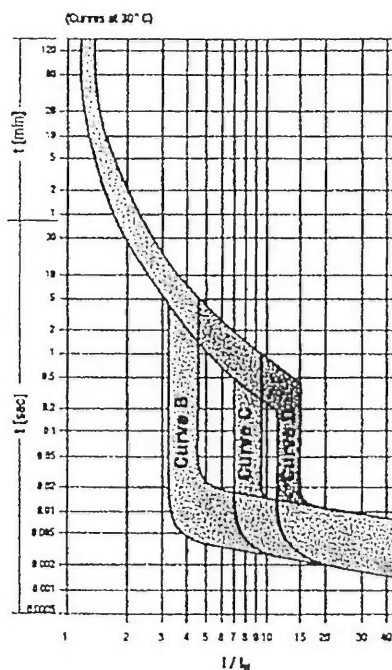


Figure 1
F&G Series L7 MCB Trip Characteristics

Type "B" Characteristic

Developed primarily to protect conductors and low level signal devices such as PLCs. Instantaneous trip is three to five times the rated current of the MCB ($3-5 \times I_n$). The fast trip time of these devices minimizes damage to control circuit conductors from low-level faults.

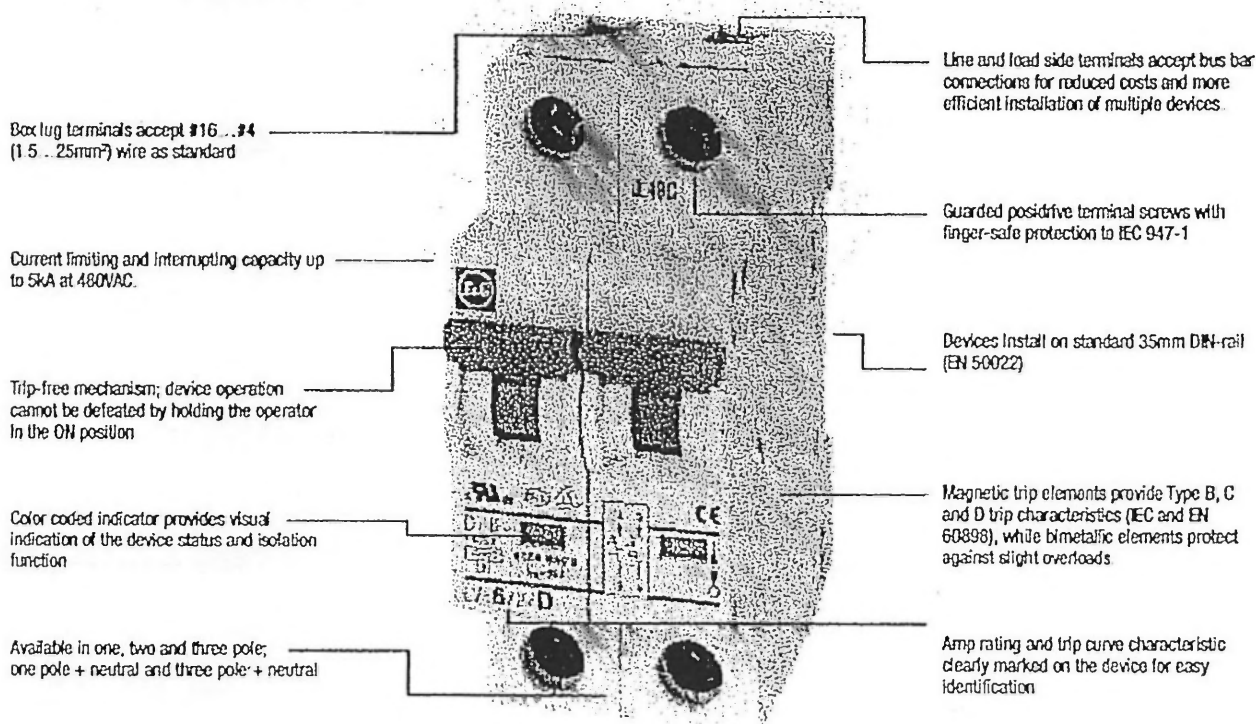
Type "C" Characteristic

Developed primarily for applications with moderate inrush currents such as lighting, control circuits and coils, computers and appliances. Instantaneous trip is five to ten times the rated current of the MCB ($5-10 \times I_n$). The higher instantaneous trip level prevents nuisance tripping, and components being protected can typically withstand higher fault currents without being damaged.

Type "D" Characteristic

Developed primarily for applications with high inrush currents, i.e., transformers, power supplies and heaters. Instantaneous trip is ten to twenty times the rated current of the MCB ($10-20 \times I_n$). The high instantaneous trip level prevents nuisance tripping, and components being protected can typically withstand higher fault currents without being damaged.

Compare these advanced features





L7 Miniature Circuit Breakers

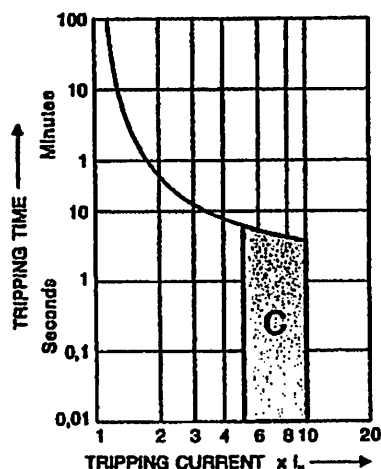
Trip Characteristic C

NEW

Trip Characteristic C (5~10 x I_n) – Inductive loads

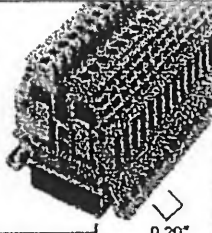
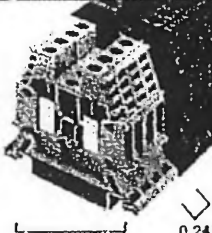
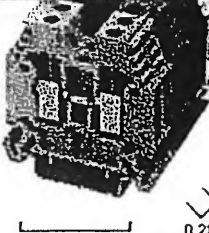
Rated Current (A)	1 Pole			2 Pole			3 Pole		
	Catalog Number	Price	Std. Pkg.	Catalog Number	Price	Std. Pkg.	Catalog Number	Price	Std. Pkg.
0.5	L7-5/1/C	42	12	L7-5/2/C	96	6	L7-5/3/C	138	4
1	L7-1/1/C	42	12	L7-1/2/C	96	6	L7-1/3/C	138	4
2	L7-2/1/C	42	12	L7-2/2/C	96	6	L7-2/3/C	138	4
3	L7-3/1/C	42	12	L7-3/2/C	96	6	L7-3/3/C	138	4
4	L7-4/1/C	42	12	L7-4/2/C	96	6	L7-4/3/C	138	4
5	L7-5/1/C	42	12	L7-5/2/C	96	6	L7-5/3/C	138	4
6	L7-6/1/C	42	12	L7-6/2/C	96	6	L7-6/3/C	138	4
7	L7-7/1/C	42	12	L7-7/2/C	96	6	L7-7/3/C	138	4
8	L7-8/1/C	42	12	L7-8/2/C	96	6	L7-8/3/C	138	4
10	L7-10/1/C	42	12	L7-10/2/C	96	6	L7-10/3/C	138	4
13	L7-13/1/C	42	12	L7-13/2/C	96	6	L7-13/3/C	138	4
15	L7-15/1/C	42	12	L7-15/2/C	96	6	L7-15/3/C	138	4
16	L7-16/1/C	42	12	L7-16/2/C	96	6	L7-16/3/C	138	4
20	L7-20/1/C	42	12	L7-20/2/C	96	6	L7-20/3/C	138	4
25	L7-25/1/C	42	12	L7-25/2/C	106	6	L7-25/3/C	156	4
30	L7-30/1/C	42	12	L7-30/2/C	106	6	L7-30/3/C	156	4
32	L7-32/1/C	42	12	L7-32/2/C	106	6	L7-32/3/C	156	4
40	L7-40/1/C	52	12	L7-40/2/C	118	6	L7-40/3/C	174	4
50	L7-50/1/C ●	52	12	L7-50/2/C ●	136	6	L7-50/3/C ●	200	4
63	L7-63/1/C ●	52	12	L7-63/2/C ●	152	6	L7-63/3/C ●	228	4

Standard Stocked Item



● CE Approval only. cULus approval pending. Contact your Sprecher + Schuh representative.

Standard Feed-Through Blocks

Ordering and Technical Information O	2.5 mm ²				4 mm ²				6 mm ²			
												
	1.30" (35 mm) 1.78" (45.3 mm) 0.20" (5 mm)				1.30" (35 mm) 1.78" (45.3 mm) 0.24" (6 mm)				1.61" (41 mm) 1.87" (47.6 mm) 0.28" (7 mm)			
	Single circuit terminal block.				Single circuit terminal block.				Single circuit terminal block.			
	Catalog Number	Price Ea. (Std Pkg)	Pkg Qty		Catalog Number	Price Ea. (Std Pkg)	Pkg Qty		Catalog Number	Price Ea. (Std Pkg)	Pkg Qty	
Terminal - Gray	V7-W3	1.80	50		V7-W4	2.05	50		V7-W6	2.15	50	
Red	V7-W3-RE	1.90	50		V7-W4-RE	2.15	50		V7-W6-RE	2.30	50	
Blue	V7-W3-B	1.90	50		V7-W4-B	2.15	50		V7-W6-B	2.25	50	
Black	V7-W3-BL	1.90	50		V7-W4-BL	2.15	50		V7-W6-BL	2.30	50	
Green	V7-W3-G	1.90	50		V7-W4-G	2.15	50		V7-W6-G	2.30	50	
Yellow	V7-W3-Y	1.90	50		V7-W4-Y	2.15	50		V7-W6-Y	2.30	50	
Orange	V7-W3-OR	1.90	50		V7-W4-OR	2.15	50		V7-W6-OR	2.30	50	
White	V7-W3-W	1.90	50		V7-W4-W	2.15	50		V7-W6-W	2.25	50	
Brown	V7-W3-BR	1.90	50		V7-W4-BR	2.15	50		V7-W6-BR	2.30	50	
Accessories (also see pages 26 to 31)												
End Barrier	V7-EB3	0.80	50		V7-EB3	0.80	50		V7-EB10	1.00	50	
End Anchors												
DIN Rail — Normal Duty	V7-EA35	1.15	50		V7-EA35	1.15	50		V7-EA35	1.15	50	
DIN Rail — Heavy Duty	V7-EAH35	4.35	10		V7-EAH35	4.35	10		V7-EAH35	4.35	10	
Jumpers												
Side Jumper — 10-pole Insulated	V7-SJ5-10	2.10	5		V7-CJ6-50	24.65	5					
Center Jumper — 50-pole	V7-CJ5-50	28.00	10		V7-CJ6-10	6.25	10		V7-CJ7-10	7.40	10	
Center Jumper — 10-pole	V7-CJ5-10	5.95	10		V7-CJ6-3	2.30	10		V7-CJ7-3	2.75	10	
Center Jumper — 3-pole	V7-CJ5-3	2.20	10		V7-CJ6-2	1.50	10		V7-CJ7-2	1.95	10	
Center Jumper — 2-pole	V7-CJ5-2	1.55	10		V7-CJ6-1	0.90	10		V7-CJ7-1	0.90	10	
Center Jumper Link	V7-CJL5	0.80	10		V7-CJ6-6	2.55	20		V7-CJ7-6	2.55	20	
Center Jumper Cover — White	V7-CJCW5	3.15	20		V7-CJ6W6	3.55	20		V7-CJ7W6	3.55	20	
Other Accessories												
Partition Plate	V7-PP3	1.00	50		V7-PP3	1.00	50		V7-PP10	1.20	50	
Separation Plate	V7-SP3	0.60	50		V7-SP3	0.60	50					
Test Plug Adapter	V7-TA285	11.80	10		V7-TA40	11.80	10		V7-TA40	11.80	10	
Electrical Warning Plate (4-pole)	V7-EWP5-4	4.05	10		V7-EWP6-4	4.05	10		V7-EWP7-4	4.35	10	
Group Marking Carrier	V7-GM35	2.40	10		V7-GM35	2.40	10		V7-GM35	2.40	10	
Marking Systems												
Blank Tags (cards of 100)	V7-SM5X9	6.25	5		V7-SM6X12	7.00	5		V7-SM6X12	7.00	5	
	V7-SM5X12	6.25	5									
Pre-printed Tags (sticks of 10)	V7-MP5	7.00	10		V7-MP	1.80	10		V7-MP	1.80	10	
Terminal Block Specifications												
Approvals	UL	UL	IEC	EEEx e II	UL	UL	IEC	EEEx e II	UL	UL	IEC	EEEx e II
Voltage Rating	600V AC/DC	600V AC/DC	800V AC/DC	550V	600V AC/DC	600V AC/DC	800V AC/DC	550V	600V AC/DC	600V AC/DC	800V AC/DC	550V
Maximum Current	20 A	20 A	24 A	24 A	30 A	30 A	32 A	32 A	40 A	40 A	41 A	41 A
Wire Range (Rated Cross Section)	#22... #14 AWG	#30... #14 AWG	0.5...2.5 mm ²	2.5 mm ²	#22... #10 AWG	#22... #10 AWG	0.5...4 mm ²	4 mm ²	#22... #10 AWG	#22... #10 AWG	0.5...6 mm ²	6 mm ²
Wire Strip Length	0.39" (10 mm)				0.35" (9 mm)				0.47" (12 mm)			
Recommended Tightening Torque	5.0...5.6 lb-in. (0.6 Nm)				5.0...5.6 lb-in. (0.6 Nm)				5.6...6.8 lb-in. (0.7 Nm)			
Density	61 pcs./ft (200/m)				50 pcs./ft (166/m)				43 pcs./ft (142/m)			
Insulation Temperature Range	-40°...+195°F (-40°...+90°C)				-40°...+195°F (-40°...+90°C)				-40°...+195°F (-40°...+90°C)			
Mounting Rail	Fits all types shown on page 32.				Fits all types shown on page 32.				Fits all types shown on page 32.			

Refer to pages 26-31 for a listing of all V7 accessories.

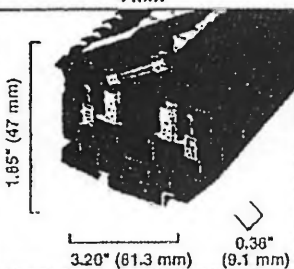
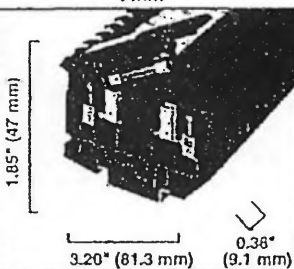
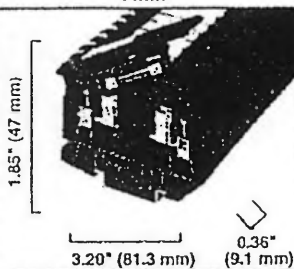
May only be used as a marking surface. Cannot be installed over a center jumper.

Custom marking tags available. See Marking System section for full offering.

See pages 66-76.

Catalog number is not complete. See pages 70-71.

Fuse Blocks

Ordering and Technical Information	4 mm ²			4 mm ²			4 mm ²		
									
	1.85" (47 mm)			1.85" (47 mm)			1.85" (47 mm)		
	3.20" (81.3 mm) 0.36" (9.1 mm)			3.20" (81.3 mm) 0.36" (9.1 mm)			3.20" (81.3 mm) 0.36" (9.1 mm)		
	Single-circuit fusible terminal block with neon blown fuse indicator.			Single-circuit fusible terminal block with LED blown fuse indicator.			Single-circuit fusible terminal block without a blown fuse indicator.		
	Catalog Number	Price Ea. (Std Pkg)	Pkg Qty	Catalog Number	Price Ea. (Std Pkg)	Pkg Qty	Catalog Number	Price Ea. (Std Pkg)	Pkg Qty
Terminal	V7-H4	12.55	25	V7-I15	17.50	25	V7-I16	9.45	25
Accessories (also see pages 26 to 31)									
End Barrier	V7-N37	1.00	50	V7-N37	1.00	50	V7-N37	1.00	50
End Anchors									
DIN Rail — Normal Duty	V7-EA35	1.15	50	V7-EA35	1.15	50	V7-EA35	1.15	50
DIN Rail — Heavy Duty	V7-EAH35	4.35	10	V7-EAH35	4.35	10	V7-EAH35	4.35	10
Jumpers									
Side Jumper — 10-pole Uninsulated	V7-M49	4.05	10	V7-M49	4.05	10	V7-M49	4.05	10
Side Jumper — Insulating Sleeve	V7-SJS	1.80	10	V7-SJS	1.80	10	V7-SJS	1.80	10
Other Accessories									
Group Marking Carrier	V7-GM35	2.40	10	V7-GM35	2.40	10	V7-GM35	2.40	10
Marking Systems									
Blank Tags (cards of 100)	V7-SM8X12	7.00	5	V7-SM8X12	7.00	5	V7-SM8X12	7.00	5
Terminal Block Specifications									
Approvals	UL	PA	IEC	UL	PA	IEC	UL	PA	IEC
Voltage Rating	300V AC/DC	300V AC/DC	500V AC/DC	300V AC/DC	300V AC/DC	500V AC/DC	300V AC/DC	300V AC/DC	500V AC/DC
Maximum Current	12 A	12 A	12 A	12 A	12 A	12 A	12 A	12 A	12 A
Wire Range (Rated Cross Section)	#30... #12 AWG	#30... #12 AWG	0.05...4 mm ²	#30... #12 AWG	#30... #12 AWG	0.05...4 mm ²	#30... #12 AWG	#30... #12 AWG	0.05...4 mm ²
Indicator Type	Neon			LED			Non-Indicating		
Leakage Current	2mA @ 300V			2mA @ 24V					
Working Voltage	100...300V AC/DC			10...57V AC/DC			Per Fuse Rating		
Fuse Size (Not Supplied)	1/4" x 1-1/4"			1/4" x 1-1/4"			1/4" x 1-1/4"		
Wire Strip Length	0.36" (9.7 mm)			0.38" (9.7 mm)			0.38" (9.7 mm)		
Recommended Tightening Torque	3...7 lb-in. (0.3...0.8 Nm)			3...7 lb-in. (0.3...0.8 Nm)			3...7 lb-in. (0.3...0.8 Nm)		
Density	33 pcs./ft (109/m)			33 pcs./ft (109/m)			33 pcs./ft (109/m)		
Insulation Temperature Range	-40°...+221°F (-40°...+105°C)			-40°...+221°F (-40°...+105°C)			-40°...+221°F (-40°...+105°C)		
Mounting Rail	Fits all types shown on page 32.			Fits all types shown on page 32.			Fits all types shown on page 32.		

- Refer to pages 26-31 for a listing of all V7 accessories.
- Custom marking tags available. See Marking System section for full offering. See pages 66-76.

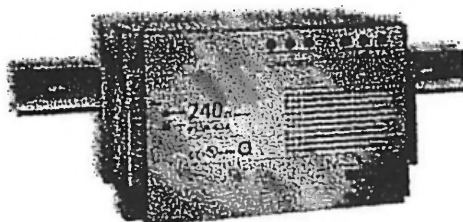
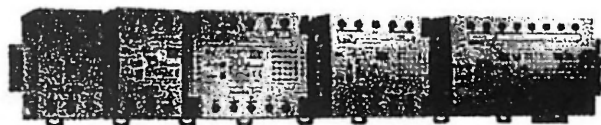
PS5R Series — Switching Power Supplies

The PS5R offers a sleek, compact, ergonomic design, worldwide approvals, and broad range of output capacities.

With UL 508 Listing, additional savings in space and cost can be realized as no derating is necessary.

Key features of the PS5R series include:

- No jumpers or dip switches
- Universal AC input (85 to 264 V AC) (except 100W)
- DC compatible input (105 to 370V DC)
- Unique spring-up, fingersafe terminals (ideal for ring lug terminated wire)
- DIN rail or panel mount
- Six output capacities
- UL508 Listing
- CE marking according to both LVD and EMC
- Fused input
- Auto resetting output overcurrent protection
- Output voltage adjust ($\pm 10\%$)



Conforms to
EMC Directives EN50081-2 and EN50082-2.
LVD Directive: EN60529.
Certified to EN60950.
240W also conforms to EN61000-3-2

L

Cert. No.
BL980213332392






UL 508 Listed

File # E177168



Specifications

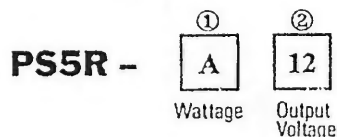
Part Numbers	5VDC output	PS5R-A05	PS5R-B05*	—	—	—	—
	12VDC output	PS5R-A12	PS5R-B12	PS5R-C12	—	—	—
	24VDC output	PS5R-A24	PS5R-B24	PS5R-C24	PS5R-D24	PS5R-E24	PS5R-G24
Output Capacity		7.5W	15W	30W	50W	100W	240W
Input	Input Voltage (single-phase, 2-wire)	100 to 240VAC nominal (85 to 264V AC), 50/60Hz (47 to 63Hz) 110 to 340VDC nominal (105 to 370VDC)				100 to 120VAC, 50/60Hz 200 to 240VAC, 50/60Hz (Jumper selectable) 240 to 370VDC	100 to 240VAC, 50/60Hz 110 to 340VDC
	Input Current (typical)	0.17A at 100VAC 0.11A at 200VAC	0.3A at 100VAC 0.2A at 200VAC	0.68A at 100VAC 0.45A at 200VAC	1.15A at 100VAC 0.75A at 200VAC	2.5A at 100VAC 1.5A at 200VAC	4A at 100VAC
	Internal Fuse Rating	2A	2A	3.15A	3.15A	4A	6.3A
	Inrush Current	50A maximum (at cold start at 200V AC)					
	Leakage Current (at no load)	0.75mA maximum (60Hz, measured in conformance with UL, CSA, VDE)					
	Typical Efficiency	73% at 12V 75% at 24V	75% at 12V 79% at 24V	75% at 12V 75% at 24V	79% at 24V	85% at 24V	83% at 24V
	Overvoltage Protection	Outputs turns off at 105% (typical)					
Output	Voltage and Current Ratings	5V, 1.5A 12V, 0.6A 24V, 0.3A	5V, 2.5A 12V, 1.2A 24V, 0.6A	12V, 2.5A 24V, 1.3A	24V, 2.1A	24V, 4.2A	24V, 10A
	Voltage Adjustments	±10% (V-ADJ screw on top)					
	Output Holding Time	20ms minimum (at full rated input and output)					
	Rise Time	200ms maximum (at full rated input and output)					150ms maximum
	Line Regulation	0.4% maximum					
	Load Regulation	1.5% maximum					
	Fluctuation due to Ambient Temperature Change	0.05% maximum					
	Ripple Voltage	2% peak to peak maximum (including noise)					
	Overload Protection	120% typical (Zener-limiting)			120% typical, auto reset		
Operation Indicator	LED						
Parallel Operation	PS5R-A	PS5R-B	PS5R-C	PS5R-D	PS5R-E	PS5R-G	
	No	No	No	No	Yes	Yes	
Dielectric Strength	Between input and output terminals: 3,000V AC, 1 minute Between input terminals and housing: 2,000V AC, 1 minute Between output terminal and housing: 500V AC, 1 minute						
Insulation Resistance	Between input and output terminals/input terminals and housing: 100MΩ minimum (500V DC megger)						
Operating Temperature	-10 to +60°C (14° to 140°F) (see derating curves)						
Storage Temperature	-30 to +85°C (-22° to 185°F)						
Operating Humidity	20 to 90% relative humidity (no condensation)						
Vibration Resistance	45m/s ² , 10 to 55Hz, 2 hours on each of 3 axes					10 to 50Hz, 0.75mm p-p, 2 hrs on each of 3 axes	
Shock Resistance	294m/s ² , 3 shocks in each of 6 directions						
Dimensions (H x W x D)	2.76" x 1.77" x2.95" (70 x 45 x 75mm)	3.74" x 1.77" x2.95" (95 x 45 x 75mm)	3.74" x 3.54" x2.95" (95 x 90 x 75mm)	3.74" x 3.54" x2.95" (95 x 90 x 75mm)	5.71" x 3.54" x 2.95" (95 x 145 x 75mm)	5.51" x 7.87" x 4.72" (140 x 200 x 120mm)	
Termination	Spring-up, fingersafe terminals with captive M3.5 screws						
IP protection	IP20 (finger safe)						
Approvals	 Cert. No. BL980213332392		 UL 508 Listed File #E177168		 Also Certified for EN61000-3-2		



1. For dimensional drawings, see page L-8
2. For usage instructions, see page L-6.
3. *12 5W for 5VDC model.

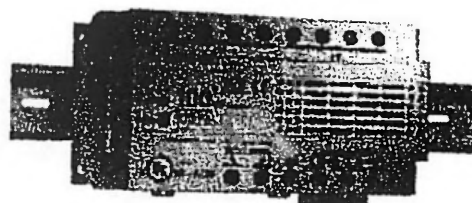
Part Number Guide

Part Numbering Guide



Part Number Codes

	Description	Code
① Wattage	7.5W	A
	15W (12.5W for 5VDC models)	B
	30W	C
	50W	D
	100W	E
	240W	G
② Output Voltage	5VDC	05 (A and B models only)
	12V DC	12 (A, B, C models only)
	24V DC	24 all models



Part Number List

Part Numbers: PS5R Series

Output Capacity	Output Voltage	Input Voltage	Part Number
7.5W	5V DC	100 to 240VAC/ (110 to 340 VDC)	PS5R-A05
	12V DC		PS5R-A12
	24V DC		PS5R-A24
15W*	5V DC	100 to 240VAC/ (110 to 340 VDC)	PS5R-B05
	12V DC		PS5R-B12
	24V DC		PS5R-B24
30W	12V DC	100 to 240VAC/ (110 to 340 VDC)	PS5R-C12
	24V DC		PS5R-C24
50W	24V DC	100 to 240VAC/ (110 to 340 VDC)	PS5R-D24
100W	24V DC	100 to 120 VAC 200 to 240 VAC (240-370 VDC)	PS5R-E24
240W	24V DC	100-240VAC (110-340VDC)	PS5R-G24



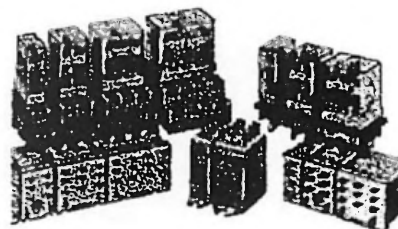
1. For dimensional drawings, see page L-8
2. For usage instructions, see page L-6.
3. For accessories, see page L-6.
4. *12.5W for 5VDC models

L

RH Series — General Purpose Midget Relays

Key features of the RH series include:

- Compact midget size **saves space**
- High switching capacity (10A)
- Choice of blade or PCB style terminals
- Relay options include indicator light, check button, and top mounting bracket
- DIN rail, surface, panel, and PCB type sockets available for a wide range of mounting applications



UL Recognized
Files No. E67770
E59804



CSA Certified
File No. LR35144



File No. BL951113332319



Ordering Information

Order standard voltages for fastest delivery. Allow extra delivery time for non-standard voltages.

Basic Part No.

Coil Voltage:

RH2B-U

AC110-120V

Specifications

Contact Material	Silver cadmium oxide
Contact Resistance	50mΩ maximum (initial value)
Minimum Applicable Load	24V DC/30mA, 5V DC/100mA (reference value)
Operating Time	SPDT (RH1), DPDT (RH2): 20ms maximum 3PDT (RH3), 4PDT (RH4): 25ms maximum
Release Time	SPDT (RH1), DPDT (RH2): 20ms maximum 3PDT (RH3), 4PDT (RH4): 25ms maximum
Maximum Continuous Applied Voltage (AC/DC) at 20°C	110% of the rated voltage
Minimum Operating Voltage (AC/DC) at 20°C	80% of the rated voltage
Drop-Out Voltage (AC)	30% or more of the rated voltage
Drop-Out Voltage (DC)	10% or more of the rated voltage
Power Consumption	SPDT (RH1): DC: 0.8W AC: 1.1VA (50Hz), 1VA (60Hz) DPDT (RH2): DC: 0.9W AC: 1.4VA (50Hz), 1.2VA (60Hz) 3PDT (RH3): DC: 1.5W AC: 2VA (50Hz), 1.7VA (60Hz) 4PDT (RH4): DC: 1.5W AC: 2.5VA (50Hz), 2VA (60Hz)
Insulation Resistance	100MΩ min (measured with a 500V DC megger)
Dielectric Strength	SPDT (RH1) Between live and dead parts: 2,000V AC, 1 minute; Between contact circuit and operating coil: 2,000V AC, 1 minute; Between contacts of the same pole: 1,000V AC, 1 minute DPDT (RH2), 3PDT (RH3), 4PDT (RH4) Between live and dead parts: 2,000V AC, 1 minute; Between contact circuit and operating coil: 2,000V AC, 1 minute; Between contact circuits: 2,000V AC, 1 minute; Between contacts of the same pole: 1,000V AC, 1 minute
Frequency Response	1,800 operations/hour
Temperature Rise	Coil: 85°C maximum Contact: 65°C maximum
Vibration Resistance	0 to 6G (55Hz maximum)
Shock Resistance	SPDT/DPDT: 200N (approximately 20G) 3PDT/4PDT: 100N (approximately 10G)
Life Expectancy	Electrical: over 500,000 operations at 120V AC, 10A; (over 200,000 operations at 120V AC, 10A for SPDT (RH1), 3PDT (RH3), 4PDT (RH4)) Mechanical: 50,000,000 operations
Operating Temperature	-30 to +70°C
Weight	SPDT: 24g, DPDT: 37g (approximately) 3PDT: 50g, 4PDT: 74g (approximately)

Part Numbers

Part Numbers: RH Series with Options

Termination	Contact Configuration	Basic Part No.	Indicator Light	Check Button	Indicator Light and Check Button	Top Bracket
B (blade)	SPDT	RH1B-U	RH1B-L*	—	—	RH1B-UT
	DPDT	RH2B-U	RH2B-UL	RH2B-UC	RH2B-ULC	RH2B-UT
	3PDT	RH3B-U	RH3B-UL	RH3B-UC	RH3B-ULC	RH3B-UT
	4PDT	RH4B-U	RH4B-UL	RH4B-UC	RH4B-ULC	RH4B-UT
V2 (PCB 0.078" [2mm] wide)	SPDT	RH1V2-U	RH1V2-L*	—	—	—
	DPDT	RH2V2-U	RH2V2-UL	RH2V2-UC	RH2V2-ULC	—
	3PDT	RH3V2-U	RH3V2-UL	RH3V2-UC	RH3V2-ULC	—
	4PDT	RH4V2-U	RH4V2-UL	RH4V2-UC	RH4V2-ULC	—

* RH1B(V2)-L is not UL recognized.

Ratings

Coil Ratings

Rated Voltage		Rated Current $\pm 15\%$ at 20°C								Coil Resistance $\pm 15\%$ at 20°C			
		60Hz				50Hz							
		SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT
AC	6V	150mA	200mA	280mA	330mA	170mA	238mA	330mA	387mA	18.8Ω	9.4Ω	6.0Ω	5.4Ω
	12V	75mA	100mA	140mA	165mA	86mA	118mA	165mA	196mA	76.8Ω	39.3Ω	25.3Ω	21.2Ω
	24V	37mA	50mA	70mA	83mA	42mA	59.7mA	81mA	98mA	300Ω	153Ω	103Ω	84.5Ω
	120V*	7.5mA	11mA	14.2mA	16.5mA	8.6mA	12.9mA	16.4mA	19.5mA	7,680Ω	4,170Ω	2770Ω	2220Ω
	240V†	3.2mA	5.5mA	7.1mA	8.3mA	3.7mA	6.5mA	8.2mA	9.8mA	3,1200Ω	15,210Ω	12,100Ω	9120Ω
		SPDT		DPDT		3PDT		4PDT		SPDT	DPDT	3PDT	4PDT
DC	6V	128mA		150mA		240mA		250mA		47Ω	40Ω	25Ω	24Ω
	12V	64mA		75mA		120mA		125mA		188Ω	160Ω	100Ω	96Ω
	24V	32mA		36.9mA		60mA		62mA		750Ω	650Ω	400Ω	388Ω
	48V	16mA		18.5mA		30mA		31mA		2,660Ω	2,600Ω	1,600Ω	1550Ω
	110V‡	8mA		9.1mA		12.8mA		15mA		13,800Ω	12,100Ω	8,600Ω	7,340Ω

* For RH2 relays = 110/120V AC.

† For RH2 relays = 220/240V AC.

‡ For RH2 relays = 100/110V DC.

Rated Voltage		Coil Inrush				Coil Inductance							
						Energizing				De-Energizing			
		SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT
AC	6V	250mA	340mA	520mA	620mA	0.09H	0.08H	0.05H	0.05H	0.06H	0.04H	0.03H	0.02H
	12V	120mA	170mA	260mA	310mA	0.037H	0.30H	0.22H	0.18H	0.22H	0.16H	0.12H	0.10H
	24V	56mA	65mA	130mA	165mA	1.5H	1.2H	0.9H	0.73H	0.9H	0.63H	0.5H	0.36H
	120V*	12mA	16mA	26mA	33mA	37H	33H	21H	18H	22H	15H	12H	9H
	240V†	7mA	8mA	12mA	16mA	130H	130H	84H	73H	77H	62H	47H	36H
		SPDT		DPDT		3PDT		4PDT		SPDT	DPDT	3PDT	4PDT
DC	6V	N/A		N/A		N/A		N/A		N/A	N/A	N/A	N/A
	12V												
	24V												
	48V												
	110V‡												

* For RH2 relays = 110/120V AC.

† For RH2 relays = 220/240V AC.

‡ For RH2 relays = 100/110V DC.

Ratings can't

Contact Ratings

Voltage	Rating	Resistive				Inductive				Motor Load		
		SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT
28V DC	UL	10A	10A	10A	10A	7.5A	—	—	7.5A	—	—	—
	UL	—	—	—	—	7A	—	—	—	—	—	—
	CSA	10A	10A	10A	10A	7A	7.5A	7.5A	7.5A	—	—	—
30V DC	Nominal	—	—	—	—	—	—	—	—	—	—	—
	UL	0.5A	0.5A	0.5A	0.5A	0.3A	0.3A	0.3A	0.3A	—	—	—
	CSA	10A	10A	10A	10A	7.5A	7.5A	7.5A	7.5A	1/6	1/6	1/6
110V DC	Nominal	—	—	—	—	—	—	—	—	—	—	—
	UL	—	—	—	—	7A	7A	7A	7A	—	—	—
	CSA	10A	10A	10A	10A	7A	7A	7A	7A	—	—	—
120V AC	Nominal	—	—	—	—	—	—	—	—	—	—	—
	UL	10A	10A	—	7.5A	7A	7A	7A	5A	1/3	1/3	1/3
	CSA	10A	10A	—	7.5A	7A	7A	7A	5A	—	—	—
240V AC	Nominal	—	—	—	—	—	—	—	—	—	—	—
	UL	7A	7.5A	7.5A	4.5A	5A	5A	5A	—	—	—	—
	CSA	7A	7.5A	7.5A	4.5A	5A	5A	5A	—	—	—	—

1. * 6.5A/pole, 20A total

2. Inductive load $\cos \phi = 0.3$, $L/R = 7ms$

Applicable Sockets

Part Numbers: Sockets

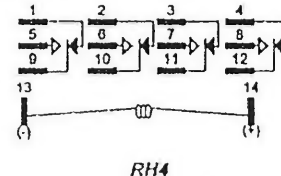
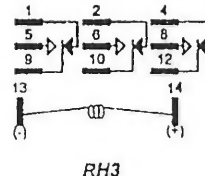
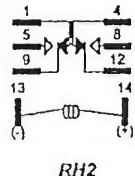
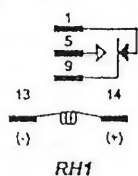
Relay	Standard DIN Rail Mount	Finger-Safe DIN Rail Mount	Surface Mount	Panel Mount	PCB Mount
RH1B	SH1B-05	SH1B-05C	—	SH1B-51	SH1B-62
RH2B	SH2B-05	SH2B-05C	SH2B-02	SH2B-51	SH2B-62
RH3B	SH3B-05	SH3B-05C	—	SH3B-51	SH3B-62
RH4B	SH4B-05	SH4B-05C	—	SH4B-51	SH4B-62

Spring & Clips (optional)

Part Number	Use With
SY2S-02F1 SFA-101 SFA-202	SH1B-05, 05C
SY4S-51F1 SFA-301 SFA-302	SH1B-51, 62
SY4S-02F1 SFA-101 SFA-202	SH2B-05, 05C
SY4S-51F1 SFA-301 SFA-302	SH2B-51, 62
SH3B-05F1 SFA-101, -202	SH3B-05, 05C
SY4S-51F1 SFA-301 SFA-302	SH3B-51, 62
SH4B-02F1 SFA-101, -202	SH4B-05, 05C
SY4S-51F1 SFA-301 SFA-302	SH4B-51, 62

See Section F for details on sockets. All DIN rail mount sockets shown above can be mounted using DIN rail BNDN1000

Internal Circuits



SECTION B



RACO Manufacturing and Engineering Co., 1400 62nd St., Emeryville, CA 94608 (510) 658-6713 800-722-6999 FAX (510) 658-3153

DIALER SPECIFICATION - VERBATIM® MODULAR SERIES VSS

Description and Phone Number Dialing:

1. The dialer shall be a solid state component capable of dialing up to 16 telephone numbers, each up to 60 digits in length. Phone numbers and Standard pulse dialing or Touch Tone DTMF dialing are user programmable via the system's keyboard or remotely via Touch Tone telephone. In addition, the dialer shall:

- ** Group Alarm Calls - On alarm, system shall selectively call the correct phone number according to the specific alarm(s).
- ** Detect Telephone Line Fault and indicate condition with Front Panel LED.
- ** Automatically select Tone versus Pulse Dialing.
- ** Monitor Call Progress - Detect Busy and Ringing Signals, Abandon Call if Busy, Wait until phone is answered to Annunciate Voice Reports.
- ** Provide Numeric Pager Support
- ** Provide PBX Support

Solid State Voice Message Recording & Playback:

2. The unit shall have two different categories of speech message capability, all implemented with permanent non-volatile solid state circuitry with no mechanical mechanisms. The unit shall allow for message recording from a remote telephone as well as from the front panel.

- ** User Field Recorded Messages: The user may record and re-record his own voice messages for each input channel and for the Station ID.
 - a. There shall be no limit on the length of any particular message within the overall available message recording time, which shall vary from 26 to 635 seconds, depending upon the number of input channels selected, and the recording rate used.
 - b. The unit shall allow selective recording of both Normal and Alarm advisory messages for each input channel.
 - c. The unit shall provide for automatic setting of the optimum speech recording rate for the total set of messages recorder, in order to achieve optimum recording sound quality.
 - d. Circuit board switches or jumper straps shall not be an acceptable means of manipulating message length or recording rates.
- ** Permanent Resident Non-Recorded Messages: Permanent built-in messages shall be included to support user programming operations, to provide supplemental warning messages such as advising that the alarms have been disabled, and to allow the unit to be fully functional even when the installer has not recorded any messages of his own.

Input Monitoring Function:

3. The basic unit shall continuously monitor the presence of AC power and the status of four (4) contact closure inputs. AC power failure, or violation of the alarm criteria at any input shall cause the unit to go into alarm status and begin dial-outs. The unit shall, upon a single program entry, automatically accept all input states as the normal non-alarm state, eliminating possible confusion about Normal Open versus Normally Closed inputs. Further, as a diagnostic aid, unit shall have the capability of directly announcing the state of any given input as currently "Closed Circuit" or "Open Circuit" without disturbing any message programming. Each input channel shall also be independently programmable, without the need to manipulate circuit board switches or jumpers, to any of the following:

- ** Normally Open, Normally Closed, or for No Alarm (Status Only).
- ** Run Time Meter - to accumulate and report the number of hours a particular input circuit has been closed. Any channel so configured will never cause an alarm call, rather, on inquiry will recite it's message according to the status of the input and then report the closed circuit time to the tenth of an hour. The input will accumulate and report in tenths of hours up to a total accumulated running time of 99,999.9 hours. The initial value of the Run Time Meter shall be programmable in order to agree with existing electromechanical Run Time Meters. Up to a total of 8 Run Time Meters may be programmed.
- ** Pulse Totalizer - to count the accumulated number of pulses (momentary contact closures) occurring at the input so programmed. Any input channel may be programmed for a Totalizer Function, up to a maximum of 8. Maximum Input pulse rate is 100 Hz, with a 50% Duty Cycle. The spoken scaled value will not "roll-over" to zero until a value of 4,294,967,294. has been exceeded.

Input/Output Expansion Capability:

4. The standard unit shall be modular in design, permitting it, therefore, to accept "plug-in" expansion circuit boards to incorporate any of the following:

- ** Contact Closure Expansion Capability to a total of 8, 16, 24, or 32 total dry contact inputs.
- ** Analog Input Capability to a total of 1, 4, 8, or 16 total analog inputs.
- ** Remote Supervisory Control Outputs to manipulate 4 or 8 output relays.

Modbus Communications:

5. The unit shall accept an expansion card which enables it to communicate directly with devices utilizing Modbus RTU Protocol. A unit so configured shall be capable of "reading" and "writing" to 32, 64, or 96 data registers via Touch Tone Telephone. No modem or host computer shall be required. Interface shall consist of a single RS-232 Serial Cable.

Printer/Computer Communications:

6. The unit shall be equipped with a centronics parallel printer port, enabling the user to print alarm reports, download programming data, and generate scheduled status reports as required. Alternatively, the unit shall be able to accept an optional modular, plug-in asynchronous communications card to permit any of the following:

- ** Local Data Logging - Permits a single dialer to communicate with a local Serial printer to log routine status reports, alarm reports, and programming data.
- ** Central Data Logging - Permits one or more dialers to communicate with a single centrally located Serial printer equipped with a suitable modem to log routine status reports, alarm reports, and programming data.
- ** Data Acquisition and Control - Permits one or more dialers to communicate with a centrally located Computer/Printer System equipped with a SCADA software package, thereby functioning as a stand alone SCADA system.

Alarm and Inquiry Messages:

7. Upon initiating an alarm call, the system is to "speak" only those channels which are currently in "alarm status". Inquiry phone calls can be made directly to the unit at any time, for a complete status report.

Acknowledgement:

8. Alarms are acknowledged either by pressing a Touch Tone "9" as the call is being received, or by calling the unit back after having received an alarm call.

Nonvolatile Program Memory Retention:

9. User-entered programming and voice messages shall be kept intact, even during power failures or when all power has been removed, for up to ten (10) years. This shall be accomplished through inclusion in the system of a lithium battery separate from the unit's backup rechargeable gel cell battery.

Local and Remote Programming Capabilities:

10. The user may optionally elect to alter the following parameters from their standard normal default values via keyboard entry or remotely from any Touch Tone telephone.

- ** Alarm Response Delay: 0.1 to 999.9 seconds, with different delays being assignable to different alarms.
- ** Delay Between Alarm Call outs: 0.1 to 99.9 minutes.
- ** Alarm Reset Time: 0.1 to 99 hours, or "No Reset".
- ** Incoming Ring Response (Answer) Delay: 1 to 20 Rings.
- ** Number Of Message Repetitions: 1 to 20 Repetitions.
- ** Autocall Test: When enabled, the unit shall place a single round of test calls, both at the time this function is enabled, and also at regular subsequent intervals until this function is disabled.
- ** Remote System Microphone Activation.
- ** Remote Arming and Disarming of System.

Phone Line:

11. The dialer is to use a standard "dial-up" telephone line (direct leased line is not required), and is to be F.C.C. approved. Connection to the telephone is through a 4-pin modular jack (RJ 11).

Speakerphone:

12. The unit shall be capable of dialing any phone number on command and functioning as a speakerphone.

Real Time Clock:

13. The unit shall be equipped with a real time clock thereby making it possible to:

- ** Alarm Ready Schedule - The dialer shall be user programmable to follow a specific schedule of operations. This shall include the flexibility to set a weekday, weekend, and holiday schedule. With this feature the dialer shall arm and disarm itself according to the schedule programmed.
- ** In the event any of the printer configurations outlined in Section 6, are utilized, all alarm reports will be time and date stamped. Routine scheduled status reports can also be programmed.

Power/Battery Backup:

14. Normal power shall be 105-135 VAC, 15 watts nominal. The product is to contain its own gel cell rechargeable battery which is automatically kept charged when AC power is present. The system shall operate on battery power for a minimum of 20 continuous hours in the event of AC power failure. A shorter backup time shall not be acceptable. The built-in charger shall be precision voltage controlled, not a "trickle charger", in order to minimize recharge time and to maximize battery life available.

Integral Surge Protection:

15. All power, phone line, dry contact and analog signal inputs shall be protected at the circuit board to IEEE Standard 587, category B(6,000 volts open circuit/3,000 amps closed circuit). Gas tubes followed by solid state protectors shall be integral to the circuit board for each line.

Technical/Customer Support:

16. All users shall be provided and/or shall have access to the following support resources.

- ** Each autodialer shall be shipped with a VHS Format Video Tape which details all features of the product and provides an in-depth step-by-step programming guide. A superficial marketing overview will not be acceptable.
- ** A Fax-on-Demand System which allows any user to call the manufacturer and retrieve copies of all technical information available directly into his own fax system. This service shall be available on a 24 hour basis.
- ** A toll free 800 number shall be available during manufacturer's normal working day to permit users to talk directly with technical service personnel and resolve problems not solved by either the Video Instruction Tape or the information provided via Fax-on-Demand.

Warranty:

17. The dialer shall be covered by a FIVE (5) YEAR warranty covering parts and labor performed at the Factory.

Additional Features: Sealed Switches, LED Indicators, Alarm Disable Warning, Talkthrough:

18. All keyboard and front panel switches shall be sealed to prevent contamination. Front panel LED's shall indicate: Normal Operation, Program Mode, Call in Progress, Status for each Channel, AC Power present, AC Power failure, and Low, Discharging, or Recharging Battery. On any inquiry telephone call, or On-Site status check, the voice shall provide specific warning if no dialout phone numbers are entered, or if the unit is in "alarm disabled" mode, or if AC power is off or has been off since last reset. A built-in microphone shall allow anyone at a remote site to listen to Local sounds and to have a two-way conversation with personnel at the dialer.

Miscellaneous Special Order Items:

19. The following options shall be available on specific order:

- ** Radio Communications Interface
- ** Various NEMA 4X (sealed) Enclosures
- ** Thermostatically Controlled Heater
- ** UL Approved Power Supply
- ** Cellular Communications Systems

SECTION

C

None	0
TrendManager Pro	P
TrendServer Pro (Single User License)	S
TrendServer Pro w/OPC (Single User License)	T

Minitrend V5 Electronic Data Recorder

08/02
Page 1 of 16
43-TV-03-03
Specification

Function

Honeywell's Minitrend V5 recorder provides flexible, general-purpose electronic data recording in a DIN standard 144mm format recorder. The recorder accepts up to 16 universal analog inputs and stores data on an integral, removable storage media. The customer has a number of storage media options available, including a dual storage capability. The data is displayed on a 5.5" color active matrix LCD that provides wide viewing angles along with bright easy to read displays. The operator interface provides easy access to the recorder menus for quick set up and replaying of the data. Data is stored under pen configurations, in secure files and since the data is directly related to a pen there is no need to remember file names and file structures.

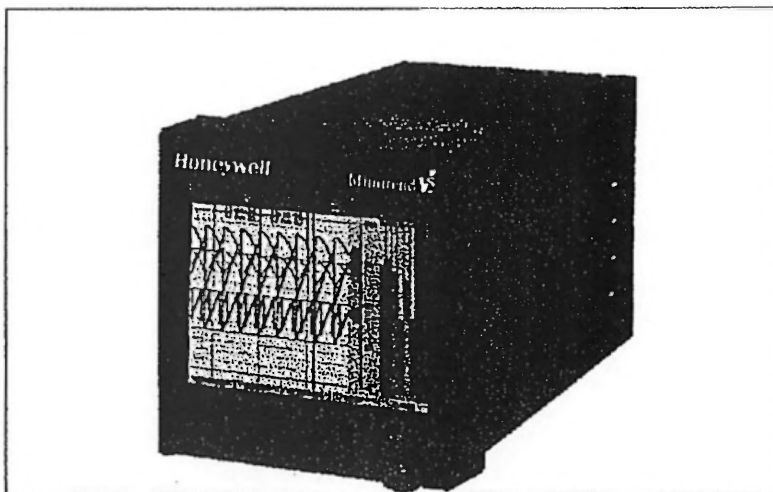
An Ethernet port provides an interface from the recorder to a LAN or the Internet for advanced networking and remote monitoring of the recorder.

Other advanced features include; Fuzzy Logging, Custom Screen Design and advanced data security to meet 21CFR Part 11 compliance for electronic data recording. Data replay is easily accomplished using the intuitive thumbwheel and keypad.

The TrendManager Pro V5 Software Suite complements the capabilities of the recorders by providing the benefits of configuration, data analysis and data acquisition using a personal computer. It ties your process together, providing for real-time or FTP communications with the recorders through a Local Area Network (LAN) or the Internet. TrendManager Pro V5 Software Suite provides the tools for viewing real time data, data analysis, data archiving and configuration for the entire family of electronic data recorders.

Features

- **5.5" Color Active Matrix Display**— makes it easy to interpret process data and take action with the easy to understand bar charts, digital values, trends or the customized display.
- **Ethernet Connectivity** — with support for various protocols provides unlimited connectivity to local area networks (LANs) or the Internet.
- **Paperless Chart Recording** — eliminates the need for paper and pens with their associated cost and mess.



Features, Continued

- **Up to 16 Analog Inputs** — up to sixteen universal analog inputs available that can monitor process variables from a variety of sensors.
- **Data Storage** — A number of data storage options are available; these include a standard 1.44MB floppy and PCMCIA interface. In addition to this the recorder is capable of supporting dual redundant storage media for added security.
- **Standard Mounting** — fits standard cutout and allows for easy replacement of existing 100 mm paper chart recorders.
- **CE Mark** — Conformity with 73/23/EEC, Low Voltage Directive and 89/336/EEC EMC Directive.
- **Total Data Integrity** — data is stored in secure files based on pen designations making it easy to retrieve the data based on process information rather than having to remember file names.
- **Independent Display Chart Speeds and Logging rates** — logging rates can be programmed completely separate from the chart display speed, allowing the data to be displayed and stored at the rates that best suits the application.
- **Universal Power** — no concern with plugging the recorder into the wrong voltage - the instrument is designed to work between 90 Vac and 250 Vac.
- **Language Support** — Standard language prompts for English (US & UK), French, German, Italian, Portuguese, and Spanish.

Features, Continued

- **Real Time Clock** — provides accurate time stamping of logged data and events and is battery backed up to prevent a loss of the clock time/date.
- **Large Memory Buffer** — Up to 8Mbyte battery-backed buffer ensures that data is not lost during routine operation.
- **Password Protection** — multiple levels of password protection provided to ensure compliance with 21CFR Part 11. Up to 4 levels of password protection with up to ten different passwords are available for use. The password can prevent unauthorized entry to the entire recorder configuration or just portions of the recorder configuration or operation.
- **Fuzzy Logging** — This standard feature provides a unique method to increase the storage capacity of the recorder. The data is monitored to determine changes in process data; if no changes are observed data is logged periodically. If data is changing rapidly, it is recorded normally at the programmed rate. By not logging data that is static, data compression of up to 100:1 or more can be observed saving valuable disk space. The amount of disk space left is easily observed and can be set up as an alarm limit to ensure that data is not lost.

Options

- **Alarm Outputs** — up to sixteen alarm outputs are easily set by users to announce selected out-of-limit conditions. Up to 8 SPDT relays are available or up to 16 discrete outputs (24Vdc, 1 Amp) are available to activate the user's external equipment.
- **Communications** — the recorder supports FTP, real time Trendbus, Modbus, web and e-mail over the Ethernet communications port. The recorder is also capable of Modbus RTU communications over an RS485 network. An RS232 port allows the use of an ASCII barcode reader to mark the chart or record batch specific data when used in conjunction with Event Markers.
- **Math** — A full function math package is available on the recorder. This feature can handle math expressions that can consist of expressions up to 250-characters in length.
- **12/24Vdc instrument power** — an optional 12/24Vdc-instrument power is available for those applications requiring 12/24Vdc-instrument power.

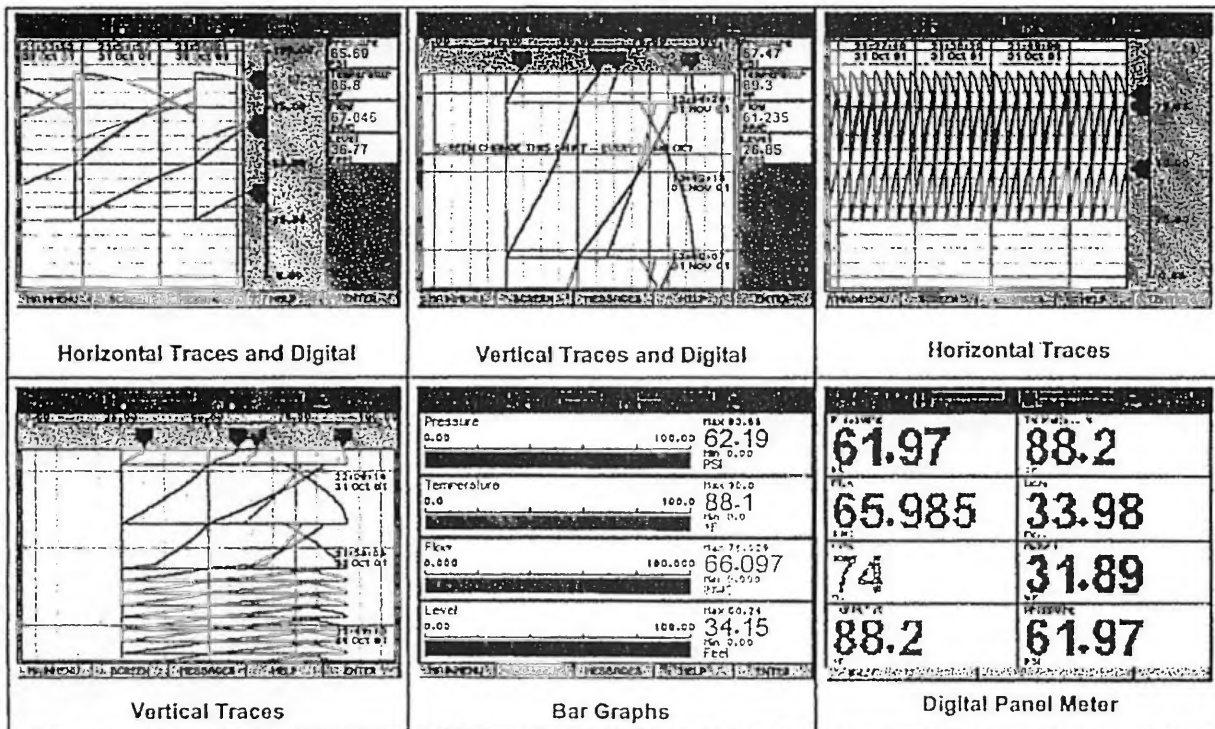
Options

- **Digital Input** — a number of digital input options are available. The digital inputs allow users to initiate from a remote location through a dry contact closure. Selected recorder functions, such as start/stop/reset totalization, mark the chart.
- **Event Markers/Actions** — provides an easy method for a user to mark an event or message on the electronic recorder. These messages are time stamped and can be up to 44 characters long. Additionally, certain recorder actions such as start/stop recording, digital inputs actions, user key presses, etc., can also be logged.
- **Extended Security Software** — an optional software function providing extended features including entry of unique User ID's and associated passwords, timeout of password entry, password expirations, and traceability by user.
- **Validation Documentation** — Honeywell can provide the additional documentation associated with using the recorder in a validated process.

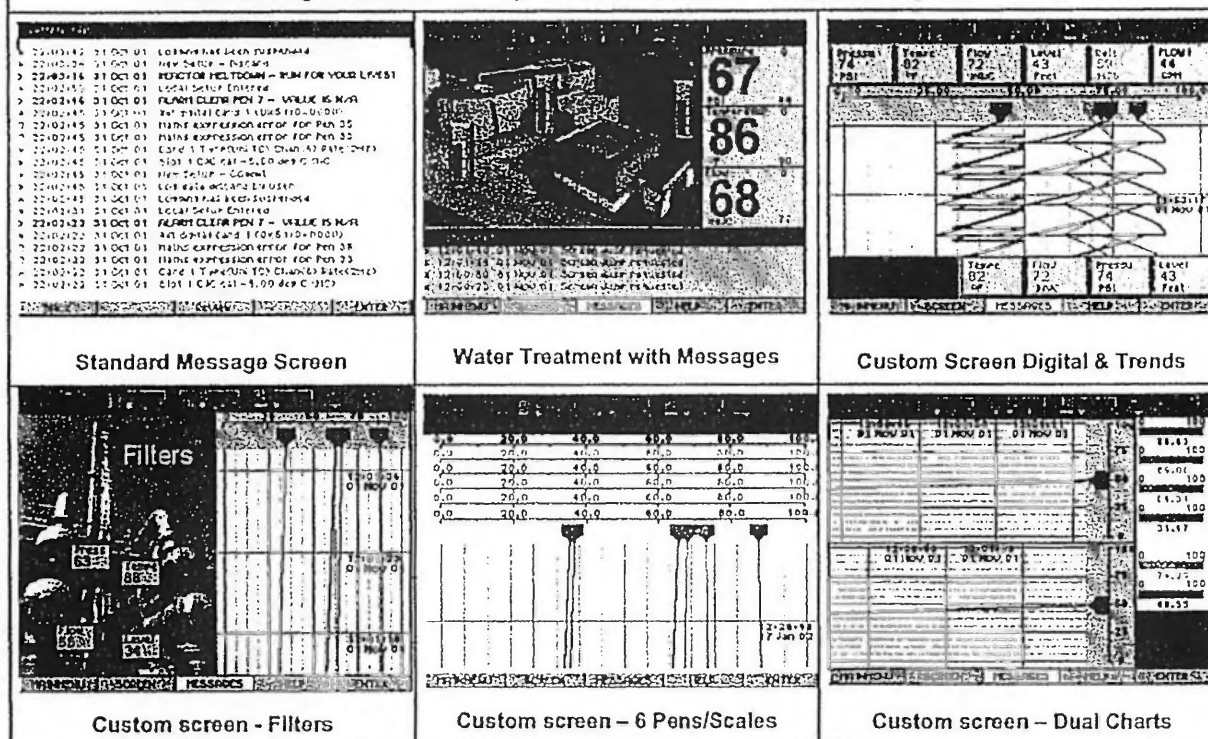
TrendManager Pro V5 Software Suite

- **TrendViewer** — Standard software package for viewing, graphing, and printing stored data.
- **TrendManager Pro** — is an advanced data analysis/archiving software package. It provides full configuration of the recorders along with e-mail set up. TrendManager Pro also allows files to be exported using comma separated variables (CSV) format.
- **TrendServer Pro** — is a fully network aware software package for communicating with the recorders. It supports all the capabilities of TrendManager Pro plus FTP (file transfer protocol) and Web browser access. TrendServer Pro provides multi-level, multi-user access to the recorder data by various departments with security.
- **TrendServer Pro with Comms Server** — TrendServer Pro is available with an OPC Server to make it easier to interface third party HMI software packages that support an OPC Client.
- **Customer ID Tagging** — Up to 3 lines of 22 characters allowed.

Standard Screens



Standard Message Screen and Examples of Custom Screens Designed using Screen Designer



Specifications

Design Attributes	
Digital Indication & Display	<p><i>Display Type:</i> Color LCD (TFT)</p> <p>Industrial grade with brightness adjustment and wide viewing angle</p> <p><i>Screen Size:</i> 5.5" diagonal</p> <p><i>Resolution:</i> QVGA (320 x 240 pixels)</p> <p><i>Screen Saver:</i> Set in minutes from 1 to 255 plus brightness adjustment</p> <p>Digital values displayed include alarms on bars, engineering units, pen name, events including tag, time & date, 20-character description & totalized values.</p>
Display Update Rate	Display values updated every second.
Memory Status Display	A status bar, at the top of the recorder's screen, constantly displays real-time icons of memory % full and Disk % full. These percentages can be used and displayed by allocating a pen in a math expression.
Mimics & Custom Screens	Provides the ability to import custom built screens and/or bit maps from the Screen Designer software.
Other Display Contents	<p>Fully programmable display values in engineering units. Time & date stamp on every division, current time & date, session number writing, writing, read only, recycling.</p> <p>Independent user-definable display screens and groups can be used to show a combination of pens, events, alarm summary and totalizer. Plant diagrams and mimics can be generated and then integrated into the recorder display in conjunction with traditional chart, bar graph and digital displays.</p>
Analog Display Methods	<p><i>Horizontal:</i> Thick or thin traces, with or without bar, max/min markers, major & minor divisions, time and date marked, name and description.</p> <p><i>Vertical:</i> Thick or thin traces, with or without bar, max/min markers, major & minor divisions, time and date marked, name and description</p>
Message screen	Displays system information and records any setup activity that has been changed. Provides warning and error message updates, lists alarm activity and places user defined marks on chart facility.

Analog Display Colors	Pen Number	Color	Pen Number	Color																																																																		
	Pen 1	Red	Pen 9	Dark Blue																																																																		
	Pen 2	Magenta	Pen 10	Blue/Green																																																																		
	Pen 3	Green	Pen 11	Khaki																																																																		
	Pen 4	Blue	Pen 12	Salmon																																																																		
	Pen 5	Cyan	Pen 13	Pink																																																																		
	Pen 6	Dark Red	Pen 14	Lime																																																																		
	Pen 7	Dark Purple	Pen 15	Light Blue																																																																		
	Pen 8	Dark Green	Pen 16	Turquoise																																																																		
Data Storage	<p>Removable Media: 3.5" 1.44Mbyte floppy and PCMCIA memory interface card. The PCMCIA interface accepts ATA Type I, Type II or Type III PCMCIA cards with a capacity of 8Mbytes to 256Mbyte flash card, up to 1.2Gbyte hard disk</p> <p>Supports dual storage media – 1.44Mbyte floppy and PCMCIA interface (requires extra pens for setting up dual data storage)</p> <p>Internal Data Buffer: 4 or 8MByte battery backed up RAM data buffer, rechargeable battery designed to retain data approximately 3 weeks if fully charged</p> <p>Setup: Stored internally on EEPROM</p> <p>Manual Saving: Data saving by inserting external floppy disk or PC card memory</p> <p>Data Saving Period: Related to log rate, number of pens, total events and alarms. Each pen is capable of its own independent storage rate.</p> <p>Data Format: Honeywell binary encoded format</p> <p>Recycling Mode: Internal memory has full data recycle capability where the newest data overwrites the oldest data.</p> <table><tr><th colspan="2">Set for Sample Storage</th><th colspan="3">Time</th><th rowspan="2">Media Type</th></tr><tr><th>Channels</th><th>1 Sec</th><th>10 Sec</th><th>30sec</th><th>1 Min</th></tr><tr><td rowspan="2">2</td><td>4D 3H 23M</td><td>41D 7H 49M</td><td>123D 23H 27M</td><td>247D 22H 45M</td><td>1.44 MB</td></tr><tr><td>287D 23H 38M</td><td>7Y 324D 19H</td><td>23Y 244D 8H</td><td>47Y 123D 7H</td><td>100MB PCMCIA</td></tr><tr><td rowspan="2">4</td><td>2D 1H 41M</td><td>20D 15H 54M</td><td>61D 23H 43M</td><td>123D 23H 22M</td><td>1.44 MB</td></tr><tr><td>143D 23H 53M</td><td>3Y 344D 21H</td><td>11Y 304D 16H</td><td>23Y 244D 3H</td><td>100MB PCMCIA</td></tr><tr><td rowspan="2">8</td><td>1D 0H 49M</td><td>10D 7H 57M</td><td>30D 23H 51M</td><td>61D 23H 41M</td><td>1.44 MB</td></tr><tr><td>71D 23H 55M</td><td>1Y 354D 22H</td><td>5Y 344D 20H</td><td>11Y 304D 13H</td><td>100MB PCMCIA</td></tr><tr><td rowspan="2">12</td><td>0D 16H 31M</td><td>6D 21H 18M</td><td>20D 15H 54M</td><td>41D 7H 47M</td><td>1.44 MB</td></tr><tr><td>47D 23H 58M</td><td>1Y 114D 23H</td><td>3Y 34D 21H</td><td>7Y 324D 17H</td><td>100MB PCMCIA</td></tr><tr><td rowspan="2">16</td><td>0D 12H 23M</td><td>5D 3H 58M</td><td>15D 11H 55M</td><td>30D 23H 50M</td><td>1.44 MB</td></tr><tr><td>35D 23H 67M</td><td>359D 23H 28M</td><td>2Y 349D 22H</td><td>5Y 334D 18H</td><td>100MB PCMCIA</td></tr></table>				Set for Sample Storage		Time			Media Type	Channels	1 Sec	10 Sec	30sec	1 Min	2	4D 3H 23M	41D 7H 49M	123D 23H 27M	247D 22H 45M	1.44 MB	287D 23H 38M	7Y 324D 19H	23Y 244D 8H	47Y 123D 7H	100MB PCMCIA	4	2D 1H 41M	20D 15H 54M	61D 23H 43M	123D 23H 22M	1.44 MB	143D 23H 53M	3Y 344D 21H	11Y 304D 16H	23Y 244D 3H	100MB PCMCIA	8	1D 0H 49M	10D 7H 57M	30D 23H 51M	61D 23H 41M	1.44 MB	71D 23H 55M	1Y 354D 22H	5Y 344D 20H	11Y 304D 13H	100MB PCMCIA	12	0D 16H 31M	6D 21H 18M	20D 15H 54M	41D 7H 47M	1.44 MB	47D 23H 58M	1Y 114D 23H	3Y 34D 21H	7Y 324D 17H	100MB PCMCIA	16	0D 12H 23M	5D 3H 58M	15D 11H 55M	30D 23H 50M	1.44 MB	35D 23H 67M	359D 23H 28M	2Y 349D 22H	5Y 334D 18H	100MB PCMCIA
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Power Requirements	<p>Voltage (VRMS): 90 Vac to 250 Vac (auto select)</p> <p>Frequency: 50/60 Hz</p> <p>Power Consumption <50 VA</p> <p>Optional instrument power</p> <p>Voltage: 12/24 Vdc +6 Vdc/-1 Vdc</p> <p>Power Consumption: < 30 watts</p>																																																																					
Password Protection	<p>Four levels of Password protection are provided – Engineer, Supervisor, Technician, and Operator. Password protection restricts user entry to the recorder set up and specific screens.</p> <ul style="list-style-type: none">• Engineer - Highest access to all levels, Supervisor, Technician and Operator.• Supervisor - 2nd highest level including Technician and Operator access• Technician - 3rd level including Operator access• Operator - 4th and lowest level of access.																																																																					
Clock	<p>Calendar function, daylight savings time adjustable manually or with communications</p> <p>The time can be adjusted and synchronized using Ethernet scheduler</p> <p>Tolerance: ±20ppm to a resolution of 1 second</p> <p>Battery backed up, Lithium battery ~ 10 years life (powered)</p>																																																																					
Languages	English UK, English US, French, German, Italian, Portuguese (Brazilian), Spanish																																																																					
Temperature units	°C, °F or K (Kelvin)																																																																					
Recorder Identification	Recorder name, Screen name, Time and Date displayed at all times.																																																																					
Alarm Set Points	Up to 64 Integral "soft" alarm set points easily set by user to announce selected out of limit conditions. Alarm Set points defined in TrendManager Pro V5 Software Suite																																																																					
Events List	Enabling the user to review events logged, activate date option, filter screen to display specific events e.g. alarm activity only. Reset option available.																																																																					
Data Replay Mode	Data replay facility on chart displays at normal, fast or slow speeds. Data is replayed from the buffer with the buffered time available for replay dependant on chart speed.																																																																					

Chart Speeds	1 mm/hour, 5 mm/hour, 10 mm/hour, 20 mm/hour, 30 mm/hour, 60 mm/hour, 120 mm/hour, 600 mm/hour, 1200 mm/hour, 6000 mm/hour, 12000 mm/hour Chart speeds can be set independently for each chart and is independent of logging rate First channel in Screen Layout determines the display chart speed								
CE Conformity	This product conforms with the protection requirements of the following European Council Directives: 73/23/EEC, the Low Voltage Directive, and 89/336/EEC, the EMC Directive. Conformity of this product with any other "CE Mark" Directive(s) shall not be assumed.								
Immunity	Complies with EN61326								
Product Classification	Class I: Cord Connected, Panel Mounted Industrial Control Equipment with protective earthing (grounding). (EN 61010-1)								
Enclosure Rating	Front panel designed to IP 65 (IEC 529), Splash proof cover designed to IP65/NEMA 4								
Installation Category (Over-voltage Category)	Category II: (EN 61010-1)								
Emissions	Complies with EN50081-1 (Ref. IEC 664-1)								
EMC Classification	Group 1, Class A, ISM Equipment (EN 55011, emissions), Industrial Equipment (EN 61326, immunity)								
Safety	Complies with EN61010-1: 1993 Panel Mounted Equipment, Terminals must be enclosed within the panel.								
Disturbances	Complies with EN60555-2, EN60555-3								
Selismic Qualification	Complies with IEEE 344-75 (optional)								
Analog Inputs									
Number of Inputs	4, 6, 8, 12 or 16 Input channels								
Input Types	EMF (mV, V, mA) Thermocouple, RTD								
PT100/200Ω RTD Inputs NI 100/120Ω RTD Inputs Cu 10/Cu 53	The universal input card will access and work with all RTD, T/C and Linear Input signals. The Fast Scan Input card does not accept Cu 10/CU53 Inputs and if set to RTD or T/C ranges the scan rate is 200ms or 500ms								
PT100/200 Ω RTD Inputs NI 100/120Ω RTD Inputs	This universal input card will access and work with all the RTD Inputs. It accepts the T/C and Linear input signals.								
Minimum Input Span	Range is fully configurable with span limitation of the operating range selected with 4% under range to 4% over range capability								
Input Resolution	0.0015 % (16 Bit ADC)								
Input Impedance	Current loop resistance dc: 10 ohms ±5%, all other: >1 MΩ								
Source Impedance	RTD: 40 ohms per lead maximum, 0.1 °C/Ω, T/C 1000Ω max., 0.5°C/100Ω								
Square Root Extraction	Scaling limits: ±1,000,000 Decimal point: User selectable Engineering units: user definable, up to 12 characters								
Input Sampling Rate	Recorder has 2 available slots of 8 analog inputs each, the input sampling rate is dependent on actuation type. For 20ms sampling all inputs for that slot must be set to linear inputs (mV, mA, V) (20msec scanning must be selected as the Fast Scanning option)								
	<table> <tr> <td>Linear only (Fast Scan Card)</td><td>20 ms (50 Hz), 200 ms (5 Hz), 500 ms (2 Hz)</td></tr> <tr> <td>Thermocouple/RTD</td><td>200 ms (5 Hz), 500 ms (2 Hz)</td></tr> <tr> <td>Universal Card</td><td>500 ms (2 Hz)</td></tr> <tr> <td>Linear Card</td><td>100 ms (10 Hz), 200 ms (5 Hz), 500 ms (2 Hz)</td></tr> </table>	Linear only (Fast Scan Card)	20 ms (50 Hz), 200 ms (5 Hz), 500 ms (2 Hz)	Thermocouple/RTD	200 ms (5 Hz), 500 ms (2 Hz)	Universal Card	500 ms (2 Hz)	Linear Card	100 ms (10 Hz), 200 ms (5 Hz), 500 ms (2 Hz)
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Universal Card	500 ms (2 Hz)								
Linear Card	100 ms (10 Hz), 200 ms (5 Hz), 500 ms (2 Hz)								
Input Filter	Single Low pass filter software adjustable from 1 to 15 seconds								
Linear Input Scaling	-999999 to 999999, scale factor of 1 to 9999 Decimal Point automatic or programmable Engineering units, user definable (5 characters)								
Input Isolation	Fast Scan or Linear Card - 100 Vdc channel-to-channel, channel-to-ground Universal Card - 400 Vdc channel-to-channel, channel-to-ground								
Noise Rejection	Universal Card - Series mode > 60db, Common mode > 130db @ 120Vac								
Input Sampling Method	Method: Sample, Average, Min-Max								
Dielectric Strength	Power supply to ground terminal: 1350 Vac (50/60 Hz), < 1minute								
Insulation Resistance	>9.9 MΩ Each terminal to ground terminal								

Performance					
Accuracy – Fast Scan or Linear Only Card					
Input Actuation (Linear)	Range		Accuracy		Temp. Stability ±
Millivolts dc	-100 to 100		+0.1%		0.01%/°C
Volts dc	-200 to 200		+0.1%		0.01%/°C
Milliamperes **	-1.0 to 1.0		+0.1%		0.01%/°C
	-10 to 10		+0.1%		0.01%/°C
	-10 to 10		+0.2%		0.01%/°C
	-20 to 20		+0.2%		0.01%/°C
Input Actuation (Thermocouples)	Range		Ref. Accuracy *		Temp. Stability ± Degrees Error Per 1 Degree ΔT
	°F	°C	± °F	± °C	
C(W5)	32 to 4172	0 to 2300	10.35	5.75	0.08%/°C
E	-328 to 1832	-200 to 1000	10.8	6	0.08%/°C
	-328 to 32	-200 to 0	5.4	3	
	32 to 1832	0 to 1000			
J	-328 to 2174	-200 to 1190	8	4.5	0.03%/°C
	-328 to 32	-200 to 0	4	2.3	0.03%/°C
	32 to 2174	0 to 1190			
K	-328 to 2462	-200 to 1350	9	5	0.03%/°C
	-328 to 32	-200 to 0	4.5	2.5	0.03%/°C
	32 to 1832	0 to 1000	5.4	3	0.03%/°C
	1832 to 2462	1000 to 1350			
L	-328 to 1652	-200 to 900	5	2.75	0.03%/°C
N (Microsil Nisli)	-328 to 2372	-200 to 1300	2.7	1.5	0.05%/°C
	-328 to 32	-200 to 0	2.7	1.5	0.04%/°C
	32 to 2372	0 to 1300			
T	-328 to 752	-200 to 400	8	4.5	0.08%/°C
	-328 to 32	-200 to 0	3.6	2	0.08%/°C
	32 to 752	0 to 400			
W	1832 to 4172	1000 to 2300	5.9	3.25	0.15%/°C
Nickel/Cobalt	-58 to 2372	-50 to 1300	1.8	1	0.05%/°C
Chrome/Copel	-58 to 1112	-50 to 600	3.6	2	0.05%/°C
Input Actuation (RTD's)	°F	°C	± °F	± °C	
PT100 100 ohms (To BS1804)	-328 to 1202	-200 to 650	3.1	1.7	0.05%/°C
PT200 200 ohms	-328 to 356	-200 to 180	7.2	4	0.05%/°C
100 ohm Nickel	-76 to 356	-60 to 180	2.7	1.5	0.05%/°C
120 ohm Nickel	-112 to 484	-80 to 240	3.2	1.75	0.05%/°C

Reference Temperature

20°C

Reference Sample Rate:

2 Hz (500msec)

Reference Humidity

65% RH ±15%

CJC Temperature Effect:

±0.05°C/°C

Reference junction Accuracy

±1.0degrees Centigrade

Long term stability:

0.2%/year

* Does not include reference junction calibration of ±2.0 °C using the standard "ice bath" method of calibration. Factory accuracy can be improved by performing a field calibration.

** Tolerance for these input types includes that of the external dropping resistors

Performance					
Accuracy – Universal Input Card					
Input Actuation (Linear)	Range		Accuracy		Temp. Stability ±
Millivolts dc	-100 to 100		+0.1%		0.01%/°C
	-500 to 500		+0.1%		0.01%/°C
Volts dc	-1.0 to 1.0		+0.1%		0.01%/°C
Milliamps **	-10 to 10		+0.1%		0.01%/°C
	4 to 20		+0.2%		0.01%/°C
	0 to 20		+0.2%		0.01%/°C
Input Actuation (Thermocouples)	Range		Ref. Accuracy *		Temp. Stability ± Degrees Error Per 1 Degree ΔT
	°F	°C	± °F	± °C	
B	212 to 500	100 to 260	30	16.7	0.13%/°C
	500 to 1000	260 to 538	8	4.5	
	1000 to 3300	538 to 1820	4	2.3	
C(W5)	32 to 600	0 to 316	3.5	2	0.06%/°C
	600 to 3600	316 to 1982	3	1.7	
	3600 to 4172	1982 to 2300	3.5	2	
E	-328 to -202	-200 to -130	25	14	0.06%/°C
	-202 to 1832	-130 to 1000	2.3	1.3	
J	0 to 1600	-18 to 871	1.2	0.6	0.03%/°C
K	0 to 2400	-18 to 1316	2	1.2	0.03%/°C
L	-328 to 1652	-200 to 900	5	2.75	0.03%/°C
N (Microsil Nisil)	0 to 2372	-18 to 1300	2	1.2	0.05%/°C
R	0 to 500	-18 to 260	5	2.8	0.1%/°C
	500 to 3100	260 to 1704	2.2	1.2	0.1%/°C
S	0 to 500	-18 to 260	5	2.8	0.1%/°C
	500 to 3100	260 to 1704	2.2	1.2	0.1%/°C
T	-300 to 700	-184 to 371	2	1.2	0.08%/°C
W _{W2s}	1832 to 4172	1000 to 2300	3.5	2	0.06%/°C
Nickel/Cobalt	-58 to 2480	-50 to 1360	2.4	1.4	0.05%/°C
Chromel/Copel	-58 to 1110	-50 to 600	3.2	1.8	0.05%/°C
Input Actuation (RTD's)	°F	°C	± °F	± °C	
PT100 100 ohms IEC α=0.00385	-300 to 1200	-184 to 649	1.4	0.8	0.05%/°C
PT200 200 ohms	-300 to 1200	-184 to 649	0.9	0.5	0.05%/°C
100 ohm Nickel	-76 to 356	-60 to 180	4.5	2.5	0.05%/°C
120 ohm Nickel	-112 to 464	-80 to 240	4.5	2.5	0.05%/°C
Cu 10	-4 to 482	-20 to 250	2.5	1.4	0.05%/°C
Cu 53	32 to 302	0 to 150	1.7	0.8	0.05%/°C

Reference Temperature: 20°C Reference Sample Rate: 2 Hz (500msec)

Reference Humidity: 65% RH ±15% CJC Temperature Effect: ±0.05°C/°C

Reference Junction Accuracy: ±1.0 degrees Centigrade Long term stability: 0.2%/year

* Does not include reference junction calibration of ±1.0 °C using the standard "ice bath" method of calibration. Factory accuracy can be improved by performing a field calibration.

** Tolerance for these input types includes that of the external dropping resistors

Logging	
Logging Method	Sample, Average, Min/Max
Logging Types	Continuous, Events, Fuzzy
Logging Rates	From 20 msec. to 4 days per pen
Fuzzy Logging	A secure data storage technique which typically delivers data compression ratio of 100:1 or more; self teaching, storing the data at a variable rate to match the process
Physical Parameters	
Enclosure	Case: Mild steel, zinc plated and passivated Bezel: Aluminum, black polyester powder coat Splash proof cover, designed to IP65/Nema 4
Mounting (Panel)	Flush panel mounting on a vertical plane. Mounting adjustable for panel thickness of 2 mm to 100 mm. Adapter kits available for covering existing panel cutouts. ± 15° from the horizontal, for 1.44MB Floppy ± 25° from the horizontal
Dimensions	W: 144 mm, H: 144 mm, D: 285 mm (Depth includes 40 mm recommended clearance for power cable and signal connectors as supplied). Cutout 138 x 138mm/5.43 x 5.43"
Weight	3.5 Kg max.
Color	Bezel: Black
Wiring Connections	IEC Power Plug. Removable terminal strip for input and alarm connections
Options	
Alarm Outputs (optional)	An alarm signal is outputted from the rear panel, via a 24-way connector, as a relay contact signal. Programmable alarm set points can be configured to activate up to 16 relay outputs. Alarm types comprise of high and low rate of change. Programming of alarm parameters is done using Trend Manger Software Update rate: 200 ms for all alarms Number/Type: <ul style="list-style-type: none"> • 4 or 8 relay contacts NO/NC, 3 A, 240 Vac/dc (non-inductive, internally suppressed) • 8 I/O or 16 I/O - 1 A 24 Vdc (non-inductive, internally suppressed) Activation: Fully programmable internal alarm levels or rates of change. Freely assignable to any relay or discrete output.
Digital I/O (optional)	2, 8 or 16 channel digital input/output card where all channels may be used as digital inputs. A digital input is provided by a volt free contact between the normally open (NO) and a common (C) terminal of an output relay if not used as alarm outputs.
Custom Screens & Mimics (optional)	Provides the capability in the recorder to accept custom screen designs and bit maps from the Screen Designer software. Depending on the size of the screen designs, up to 10 screens can be loaded into the recorder memory.
Event Marker (optional)	User defined process events are recorded and can be set to cause particular recorder actions. Events can consist of recording start/stop, digital inputs, user key press, totalizing actions, timers, barcode, etc. Once an event has been caused it can produce a definable set of effects on the recorder which can include, mark on chart, relay outputs, recording control, counters, totalizing actions, triggering other event. Each event marker can be recorded to disk for analysis using the TrendManager Software Suite. Event Markers required when using the RS232 ASCII port to input bar code messages.
Transmitter Power (optional)	18 v – 24 v, 200 mA. Max.
Communications (optional)	RS485 supporting Honeywell Trendbus Protocol. Trendbus is used in conjunction with TrendServer Pro Ethernet 10 Base –T connector supporting Real time Trendbus, Modbus, FTP protocol, Internet, e-mail Ethernet 10 Base –T connector/RS485 Trendbus/RS232 ASCII – Ethernet support Real time Trendbus, Modbus, FTP protocol, Internet, e-mail, RS485 supports Trendbus protocol, RS232 supports bar code input (Event Marker option required to enter bar code messages) RS485 (4-wire) supporting Modbus RTU protocol

Analog Outputs (Re-transmission) (optional)	2 or 4 re-transmission outputs available; each output is driven by a pen. Analog inputs, totalized values or any mathematical result can be re-transmitted. <i>Update Rate:</i> 200 msec all channels <i>Type:</i> 4 mA to 20 mA, 0 mA to 24 mA <i>Resolution:</i> 0.0015% <i>Accuracy:</i> $\pm 0.25\%$ <i>Maximum Load Resistance:</i> 500 Ω <i>Isolation:</i> 300 Vdc			
Totalizers (optional)	One totalizer per input. Totalizer value is assigned to a pen for data storage. Totalization values are ten digits plus exponent.			
Extended Security (Optional)	Provides full support for 21 CFR Part 11. Includes features for entry of unique User ID's and associated passwords, timeout of password entry (1 to 10 min.), password expiration (1 to 190 days), up to 20 users, password re-entry lock out for incorrect entry of password more than 3 times, no re-use of passwords (programmable 4 to 12 times), tracibility by user name			
Agency Approval	CE Mark Standard, CSA (Optional) Certificate Number L101284, UL (Optional) File # 201698			
Math Algorithms	All analog input channels have a math expression block. This is a fully user programmable 250 character free form math expression for each pen. Math calculations available on all pens. plus up to 8 extra pens. Standard Math Includes Add, Subtract, Multiply, and Divide.			
Math Algorithms (Optional)	Math Expressions			
	Square	Square root	Modulus	Log
	LN (natural log)	Lowest	Highest	Round
	Reciprocal	Absolute	Totalized	Over
	Under	Inside	Outside	SIN
	COS	TAN	$^{\circ}\text{F}$ to $^{\circ}\text{C}$	$^{\circ}\text{C}$ to $^{\circ}\text{F}$
	Rolling Average	Delay	Index Analog	Index Digital
	Index Relay Output	Evaluate	Exponential	Floor
	Ceiling	Cold Junction Comp.	Counter Alarms	Counter Digital
	Counter Events	Counter User	Root	Power
	ACOS	ASIN	ATAN	SINH
	COSH	TANH	ASINH	ACOSH
ATANH	AL (Alarm Status)			
TDC Trend Recorder Connector	Optional rear cover with 50-pin connector for direct connection of recorder. TDC2000/3000 system using Vutronic Trend Recorder, 24Vdc Instrument Power only.			
Miscellaneous	Customer ID Tagging (3 lines of up to 22 characters each line)			
Environmental and Operating Conditions				
Parameter	Reference	Rated	Extreme	Transport and storage
Ambient Temperature	67 $^{\circ}\text{F}$ to 77 $^{\circ}\text{F}$ 19 $^{\circ}\text{C}$ to 25 $^{\circ}\text{C}$	58 $^{\circ}\text{F}$ to 104 $^{\circ}\text{F}$ 15 $^{\circ}\text{C}$ to 40 $^{\circ}\text{C}$	32 $^{\circ}\text{F}$ to 122 $^{\circ}\text{F}$ 0 $^{\circ}\text{C}$ to 50 $^{\circ}\text{C}$ 0 $^{\circ}\text{C}$ to 40 $^{\circ}\text{C}$ (Floppy)	-14 $^{\circ}\text{F}$ to 140 $^{\circ}\text{F}$ -10 $^{\circ}\text{C}$ to 60 $^{\circ}\text{C}$
Relative Humidity (%RH)	50 to 65*	10 to 80*	5 to 90*	5 to 95*
Vibration				
Frequency (Hz)	0	0 to 70	0 to 100	0 to 100
Acceleration (g)	0	0.1	0.2	0.5
Mechanical Shock				
Acceleration (g)	0	1	5	20
Duration (ms)	0	30	30	30
Mounting Position from Vertical				
Tilted Forward	5 $^{\circ}$	20 $^{\circ}$	25 $^{\circ}$	Any
Tilted Backward	5 $^{\circ}$	20 $^{\circ}$	25 $^{\circ}$	Any
Tilted to Side (\pm)	5 $^{\circ}$	20 $^{\circ}$	25 $^{\circ}$	Any
Power Requirements				
Voltage (VRMS)	119 to 121	90 to 250	90 to 250	N/A
Frequency (Hz)	49.8 to 60.2	47 to 440	47 to 440	N/A
Power Consumption	50 VA maximum			
Warm Up	30 minutes minimum			

* The maximum rating only applies up to 104 $^{\circ}\text{F}$ (40 $^{\circ}\text{C}$). For higher temperatures, the RH specification is de-rated to maintain constant moisture content

Application Software - TrendManager Pro V5 Software Suite

TrendViewer software is available at no charge when ordering any recorder; it allows the user to view, graph and print data.

TrendManager Pro is a stand-alone package that delivers to the user total recorder configuration, simulates the recorder's performance on the PC, and archives, graphs, prints and exports data. Full data graphing, archiving and export tools are included.

Minimum System requirements for TrendViewer and TrendManager Pro:

- 200 MHz Pentium processor or higher
- 3.5" Floppy disk drive
- CD-ROM drive
- Monitor recommended screen resolution 800 x 600 minimum requirement, high color
- Windows 98SE, 2000, ME, XP, NT ver. 4.0 with Service pack 6, onwards
- 32 Mbyte of RAM (64 Mbyte recommended)
- 10 Mbyte free hard disk space
- A mouse

TrendServer Pro is a fully network aware package, which allows data viewing, archiving and communications. The recorder uses a

RS485 network or can access them directly with the recorder's own Ethernet TCP/IP port. Standard kit includes data archive tools plus E-mail, graph, print import and export data facilities.

Minimum System requirements for TrendServer:

- 450 MHz Pentium processor or higher
- CD-ROM drive
- Monitor recommended screen resolution 1024 x 768 minimum requirement, high color
- 2 Gbyte Hard-drive free disk space
- Windows 98SE, 2000, ME, XP, NT ver. 4.0 with Service pack 6, onwards
- 64 Mbyte of RAM
- TCP IP installed
- A mouse

TrendServer Pro with Comms Server provides the same functions as the TrendServer Pro but includes the added function of an integrated Comms Server to allow easy interfacing to third party HMI software packages that support an OPC Client. This provides a real-time interface between servers and clients.

Screen Designer enables the customers to design unique display layouts for transfer to the recorder's screen. Screen layouts can be created using any combination of indicators such as trending Charts, Digital Panel Meters (DPM), Bar graphs, Bitmaps, Digital pictures and Plant diagrams. Flexibility allows each type of indicator to have elements of its appearance changed to create an individual presentation.

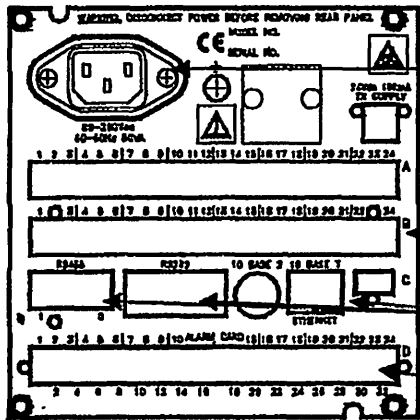
The **Screen Designer** software design package is compatible with **Minitrend V5** and **Multitrend Plus V5** recorders allowing layouts to be transferred on to single or multiple recorders. This contributes to continuity and standardization of process data.

Minimum System requirements for Screen Designer:

- 200 MHz Pentium processor or higher
- 3.5" Floppy disk drive
- CD-ROM drive
- Windows 98SE, 2000, ME, XP, NT ver. 4.0 with Service pack 6, onwards
- 32 Mbytes of RAM (64 Mbytes recommended)
- 16 bit color graphics (24 bit recommended)
- 10 Mbytes free hard disk space
- A mouse

Trend Manager Suite Comparison

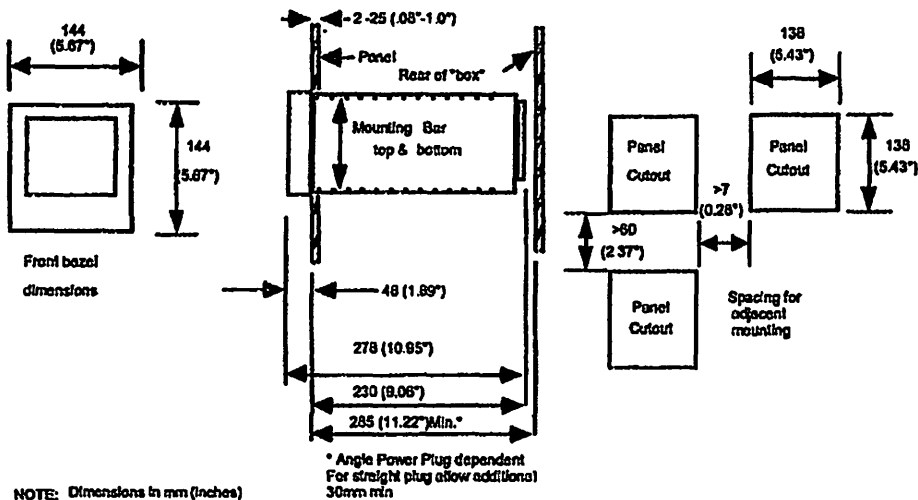
Features	Trend Viewer	Trend Manager	Trend Server
Full Configuration of any recorder on PC		•	•
Simulate any recorder on PC		•	•
Import data from disk	•	•	•
Print all graph data and recorder configurations	•	•	•
Archive data on secure databases		•	•
Graph all data, including Ideal vs actual batch comparison		•	•
E-mail recorder configurations and data on WWW		•	•
Upgrade available over WWW	•	•	•
Export using CSV format		•	•
Export using OPC links			•
Communicate with up to 256 recorders on RS485			•
Communicate with recorders using Ethernet TCP/IP			•
Distribute recorder data over plant-wide LAN			•
FTP/IP and Real time Ethernet connection			•
Fuzzy logging		•	•
Events System		•	•
Password protection			•
Web browse a recorder			•
Send setup to recorder via Ethernet			•
Audit trail manager			•



90 – 250Vac Rear Panel AC power is connected via the standard configuration IEC chassis plug on the rear panel

Minitrend Recorder Back panel Layout

Minitrend Recorder Dimension Layout



NOTE: Dimensions in mm (inches)

SECTION D

SIEMENS

SIMATIC OP27/OP37

Operator Panels — compact, smart and powerful

Product Brief

Equipped with graphic displays, the Operator Panels allow easy operation and monitoring in the production area. Critical process operation can be monitored easily by graphical representations such as imported pictures, bargraphs and trends. The embedded alarm system provides immediate process information either on the screen or through a printer.

With SIMATIC® ProTool® — the Windows® based configuration software you can easily build your own application.

Operator Panels in different versions:

- OP27 STN display monochrome or color
- OP37 STN or TFT, optional with floppy drive

PLC communications:

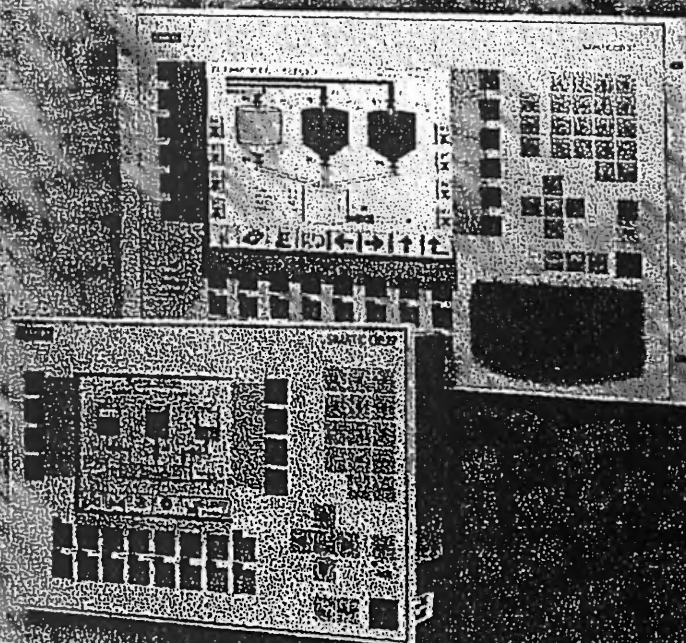
Integrated interfaces provides you communication with

- SIMATIC S7
- SIMATIC 505
- SIMATIC S5
- via PROFIBUS-DP to SIMATIC S5/S7 (up to 12 Mbps)
- Allen Bradley
- AEG Modicon
- Telemecanique
- Mitsubishi
- OMRON
- GE Fanuc

Suitable for industrial applications:

- Recipe Management
- Displaying process information
- Backup / Restore for configuration files on PC-Card
- powerful integrated alarm system
- integrated printer port
- Service tools (read/write PLC data, SIMATIC F5/S7)

SIMATIC OP27/OP37



Technical Data



	OP27	OP37
Display	Liquid Crystal Display (LCD), backlit (Cold Cathode Fluorescence Lamps)	
Display type	passive, STN	passive, STN or active, TFT
Resolution (pixels)	320 x 240	640 x 480
Display dimensions (mm)	115 x 86 (5,7")	211 x 158 (10,4")
Representation	monochrome (8 gray levels) or color (8 colors)	color (8 colors)
MTBF (h)	CCFL-bulb	CCFL-bulb
MTBF (h)	Mono: 50000 h; color: 40000 h	STN: 50000 h, TFT: 25000 h
Keyboard / Membrane		
System Keys	24	32
Function Keys (F)	10 (10 with LED's)	16 (16 with LED's)
Softkeys (S)	14 (8 with LED's)	20 (12 with LED's)
Direct Keys (D) 24 VDC	8" / 8; optional	12" / 16; optional
Processor	60486 / 33 MHz	Pentium / 100 MHz
Memory		
Flash (write/used) memory (integrated)	1/2 (Monochrome/Color) MByte Flash-EPROM	2 MByte Flash-EPROM
Main memory (DRAM)	2/4 (Monochrome/Color) MByte	8 MByte
Main memory (SRAM)	128 KByte, (battery backup)	128 KByte, (battery backup)
Hard Disk	—	3,5" / 1,44 MByte, optional
CD-ROM	Type 2	Type 2
Interfaces		
UART	TTY (active/passive), RS232-C	TTY (active/passive), RS232-C
RS-485	TTY (active/passive), RS232-C	TTY (active/passive), RS232-C
RS-422	RS 422, RS 485	RS 422, RS 485
Parallel	—	TTL (parallel)
Power Supply		
Output	24 V DC (18...30V)	24 V DC (18...30V)
Current	0,3A at 24V (without options)	1,6A at 24V (without options)
Hardware Clock	yes, battery backup	yes, battery backup
Protection from Hack	IP65 / IP20	IP65 / IP20
Dimensions		
Front plate	296 x 192	482 x 310
With cable inlet	282 x 176 x 59 mm	436 x 295 x 88 mm
Environment		
Installation position	Vertical	Vertical
• max. permissible angle of inclination without assisted installation	±35°	±35° or ±25° with floppy drive
Operating temperature	0 to +50°C	+4 to +45°C
• Operation in 100% humidity	0 to +40°C	+4 to +40°C
• Operation in 100% humidity	-20 to +60°C	-20 to +60°C
Relative humidity	≤ 95% RH, non-condensing	≤ 95%, non-condensing
• Operation	≤ 95% RH	≤ 95%
Alarm	All numbers below are based on the maximum number of characters per line (20 characters per line) and the number of lines (20 lines) of the display.	
Alarm system		
Event messages and alarm messages	up to 2000 each	up to 2000 each
Message length	2 x 35	1 x 70
Maximum number of messages	8	8
Maximum number of messages per message	7 x 35 char.	7 x 35 char.
Maximum number of messages per message	512 messages in FIFO	512 messages in FIFO
Messages		
Number of messages	max.	255
Maximum number of messages	max.	500
Maximum number of messages	max.	500
Screens		
Number of screens	max.	300
Pixel graphic	max.	max.
Symbolic graphic	max.	max.
Character fonts	max.	max.
Dynamic objects	max.	max.
Real-time with history	max.	max.
Online Languages		
Online Languages	3	3
Online Languages	9	9
Configuration software	SIMATIC ProTool, SIMATIC Manager	

¹ no additional keys, but using existing keys to connect to digital outputs

² Depth without options, OP27: D=91 mm with 24 VDC direct control of keys module or control panel interface; OP37: D=118 mm with 24 VDC direct control of keys module or control panel interface; D=138 mm with disk drive; D incl. cable inlet or +15 mm for cable inlet in the case of 24 V DC direct control keys module

Siemens AG
Automation & Drives
SIMATIC Human Machine Interface
A&D PT 1
P.O. Box 4848, D-90327 Nuremberg
www.siemens.com/panels

Siemens Aktiengesellschaft

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SECTION E

SIMATIC S7-300

Central processing units

Overview



- 8 different CPUs
- Graded performance capability for the most varied applications



Application

Various CPUs with increasing levels of performance are available for the SIMATIC S7-300:

- CPU 312 IFM, the compact CPU with integral digital inputs/outputs, for small installations with or without analog equipment
- CPU 313 for larger installations with more extensive programming requirements

- CPU 314 IFM, the compact CPU with integral digital and analog inputs/outputs for plants requiring fast response times and special functions
- CPU 314 for large installations that require extensive programming and high-speed instruction processing

- CPU 315/315-2-DP for installations requiring mid-sized to large programs and distributed configuration via PROFIBUS-DP
- CPU 316 for installations with extensive programming requirements
- CPU 318-2 for installations requiring extremely large programs and distributed configuration via PROFIBUS-DP

Design

All CPUs are accommodated in rugged, compact plastic housings

Located on the front panels are:

- Status and fault LEDs
- Key-operated mode selector
- MPI port

In addition, the CPUs have the following:

- Compartment for backup battery (not on CPU 312 IFM)
- A slot for a memory card: Memory cards with up to 512 Kbytes (flash EPROMs) can be plugged in for off-circuit program backup (not for CPU 312 and CPU 314 IFM)

- Connection for integral inputs/outputs via the front connector (CPU 312 IFM and CPU 314 IFM only)

Programming

The CPUs are programmed in LAD, FBD or STL

The engineering tools (for example, S7-GRAF, S7-Hi-Graph, SCL, CFC or SFC) can execute from CPU 314 but are only recommended for CPU 315.



SIMATIC S7-300 Central processing units



Application (cont.)
CPU 314



The CPU 314 is the CPU for demanding tasks requiring high-speed processing and mid-sized I/O configurations. It is used in installations requiring mid-sized programs and mid-range instruction execution speeds.

3

CPU 315



The CPU 315 is a powerful CPU with mid-sized to large program memory and extensive I/O configuration.

CPU 315-2 DP



The CPU 315-2 DP is a CPU with mid-sized to large program memory and PROFIBUS-DP master/slave interface. It is used in installations containing distributed automation structures as well as centralized I/O.

SIMATIC S7-300

Central processing units

CPU 312 IFM, CPU 314 IFM, CPU 315-2 DP, CPU 316

Ordering data

Order No.

Order No.

CPU 312 IFM central processing unit

6 KB RAM, integrated power supply (24 V DC), on-board I/O, process alarm inputs, integrated functions, MPI interface; incl. slot number labels and 2 keys

- Standard temperature range
- Extended temperature range

CPU 313 central processing unit
12 KB RAM, integrated power supply (24 V DC), slot for memory card, compartment for backup battery, MPI interface; incl. slot number labels and 2 keys

CPU 314 IFM central processing unit

24 KB RAM, integrated power supply (24 V DC), on-board I/O, process alarm inputs, integrated function, compartment for backup battery, MPI interface; incl. slot number labels and 2 keys

- Standard temperature range
- Extended temperature range

CPU 314 central processing unit¹⁾
24 KB RAM, integrated power supply (24 V DC), slot for memory card, compartment for backup battery, MPI interface; incl. slot number labels and 2 keys

- Standard temperature range
- Extended temperature range

CPU 315 central processing unit
48 KB RAM, integrated power supply (24 V DC), slot for memory card, compartment for backup battery, MPI interface; incl. slot number labels and 2 keys

CPU 315-2 DP central processing unit

with PROFIBUS-DP master/slave interface, 48 KB RAM, integrated power supply (24 V DC), slot for memory card, compartment for backup battery, MPI interface; incl. slot number labels and 2 keys

- Standard temperature range
- Extended temperature range

CPU 316 central processing unit
128 KB RAM, integrated power supply (24 V DC), slot for memory card, compartment for backup battery, MPI interface; incl. slot number labels and 2 keys

6ES7 312-6AG02-0AB0

6ES7 312-6AG01-0AB0

6ES7 313-1AD03-0AB0

6ES7 314-6AE03-0AB0

6ES7 314-6AE02-0AB0

6ES7 314-1AE04-0AB0

6ES7 314-1AE03-0AB0

6ES7 315-1AF03-0AB0

6ES7 315-2AF03-0AB0

6ES7 315-2AF02-0AB0

6ES7 316-1AG01-0AB0

CPU 318-2 central processing unit
with PROFIBUS-DP master/slave interface, 512 KB RAM, integrated power supply (24 V DC), slot for memory card, compartment for backup battery, MPI interface; incl. slot number labels and 2 keys

FEPRAM memory card
for CPUs 313 to 318-2;

- 16 Kbytes
- 16 Kbytes, ext. temp. range
- 32 Kbytes
- 32 Kbytes, ext. temp. range
- 64 Kbytes
- 64 Kbytes, ext. temp. range
- 128 Kbytes
- 256 Kbytes
- 512 Kbytes
- 1 Mbytes
- 2 Mbytes
- 4 Mbytes

RAM memory card
for CPU 318-2;

- 128 Kbytes
- 256 Kbytes
- 512 Kbytes
- 1 Mbytes
- 2 Mbytes

Backup battery

for CPUs 313 to 318-2;
3.6 V, 850 mAh

Front connector (1 pc.)
for CPU 312 IFM

- 20-pin, with screw-type contacts
- 20-pin, with spring-loaded contacts

for CPU 314 IFM

(2 required)

- 40-pin, with screw-type contacts

Spare keys for CPU

2 pcs. (spare part)

Slot number labels

1 set (spare part)

S7-300 manual, paper version
Configuration, CPU data, module data, operations list

- German
- English
- French
- Spanish
- Italian

S7-300 manual, electronic
incl. STEP 7, M7-300, C7-620, DP

CPU 312 IFM/CPU 314 IFM Integrated Functions manual

- German
- English
- French
- Spanish
- Italian

6ES7 318-2AJ00-0AB0

6ES7 951-0KD00-0AA0

6ES7 951-0KD80-0AA0

6ES7 951-0KE00-0AA0

6ES7 951-0KE80-0AA0

6ES7 951-0KF00-0AA0

6ES7 951-0KF80-0AA0

6ES7 951-0KG00-0AA0

6ES7 951-0KH00-0AA0

6ES7 951-0KJ00-0AA0

6ES7 951-1KJ00-0AA0

6ES7 951-1KL00-0AA0

6ES7 951-1KM00-0AA0

6ES7 951-0A000-0AA0

6ES7 951-1AH00-0AA0

6ES7 951-1AJ00-0AA0

6ES7 951-1AK00-0AA0

6ES7 951-1AL00-0AA0

6ES7 951-1AM00-0AA0

6ES7 392-1AJ00-0AA0

6ES7 392-1BJ00-0AA0

6ES7 392-1AM00-0AA0

6ES7 911-0AA00-0AA0

6ES7 912-0AA00-0AA0

6ES7 398-8AA02-8AA0

6ES7 398-8AA02-8BA0

6ES7 398-8AA02-8CA0

6ES7 398-8AA02-8DA0

6ES7 398-8AA02-8EA0

6ES7 398-8AE00-8YE0

6ES7 398-8CA00-8AA0

6ES7 398-8CA00-8BA0

6ES7 398-8CA00-8CA0

6ES7 398-8CA00-8DA0

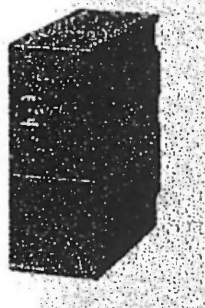
6ES7 398-8CA00-8EA0

3

SIMATIC S7-300

Power supply

Overview



- Load power supplies for the SIMATIC S7-300
- For converting the 120/130 V AC mains voltage to the required 24 V DC operating voltage
- Output current 2 A, 5 A or 10 A

Application

The S7-300 requires a 24 V DC power supply

PS 307 load power supply modules convert 120/230 V AC line voltage to the unit's 24 V DC operating voltage

They make it possible to use line power to run both the SIMATIC S7-300 and the process sensors and actuators

Design

Load power supply modules are mounted on the DIN rail (slot 1) immediately to the left of the CPU or IM 361 (on expansion racks)

The connection to the CPU or IM 361 is established using a power connector (included) Located on the front panel of the modules are:

- Output voltage indicator An LED indicating the 24 V DC output voltage

- A line voltage selector switch: A switch with a protective cap enables selection of a line voltage of 120 V AC or 230 V AC.
- On/off switch for 24 V DC.

Also located on the front of the module, protected by a cover, are:

- Connecting terminals: The line-power cables, output voltage cables and protective ground can be connected to these terminals

Load power supplies can also be mounted on a 35 mm DIN rail (EN 50 022), using the following adapters:

- 1 adapter each for the PS 307-1B and PS 307-1E;
 - 2 adapters for the PS 307-1K
- Please refer to the "STOP Power" brochure for information on further power supply modules (Order No.: E80001-V0752-A253)

Technical specifications

	PS 307-	1B	1E	1K		PS 307-	1B	1E	1K
Input					Output				
Input voltage					Output voltage				
• Rated value					• Rated value				
• Permissible range					• Permissible range				
Line outage buffering					Output current				
min.					• Rated value				
Line frequency					Short-circuit protection				
• Rated value					electronic, non-latching				
• Permissible range					General data				
Input current					Protection class				
• Rated value at 230 V					(ICE 536)				
• Rated value at 120 V					Efficiency				
Input current					Power losses				
					typ.				
					Dimensions				
					(W x H x D) in mm				
					Weight				
					approx.				
					Conductor cross-section				
					flexible, with wire and females				

SIMATIC S7-300 Power supply

PS 307-1B, PS 307-1E, PS 307-1K, PS 307-1A, PS 307-1EA, PS 307-1KA

Ordering data

PS 307 load power supply
module
incl. power connector;
120/230 V AC; 24 V DC

- PS 307-1B; 2 A
- PS 307-1E; 5 A
- PS 307-1K; 10 A

Order No.

6ES7 307-1BA00-0AA0
6ES7 307-1EA00-0AA0
6ES7 307-1KA00-0AA0



Mounting adapter
for snapping PS 307 onto a
35 mm DIN rail
(EN 50 022)
PS-CPU power connector
(spare part)

Order No.

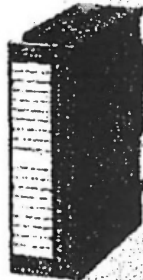
6ES7 390-6BA00-0AA0
6ES7 390-7BA00-0AA0



SIMATIC S7-300

Digital input/output modules

Overview



- Digital inputs for the SIMATIC S7-300
- For connecting switches and 2-wire proximity switches (BERO)

Application

Digital input modules convert the levels of the external digital signals transmitted from the process to the internal S7-300 signal levels

The modules are suitable for the connection of switches and 2-wire BERO proximity switches

Technical specifications

SM 321	6ES7 321-	1BH01-0AA0 1BH01-0AA01)	1BH50-0AA0	1BL00-0AA0	7BH00-0AB0 7BH00-0AB01)	1EH01-0AA0	1EL00-0AA0	1FF01-0AA0 1FF01-0AA01)
Number of inputs		16	16; source input	32	16	16	32	8
Rated load voltage L+/L1								
• Rated value		24 V DC	24 V DC	24 V DC	24 V DC	—	—	—
• Permissible range		20.4 to 28.8 V	20.4 to 28.8 V	20.4 to 28.8 V	20.4 to 28.8 V	—	—	—
Input voltage								
• Rated value		24 V DC	24 V DC	24 V DC	24 V DC	120 V AC	120 V AC	120 V/230 V AC
• for "1" signal		15 to 30 V	15 to 30 V	13 to 30 V	15 to 30 V	79 to 132 V	74 to 132 V	79 to 264 V
• for "0" signal		-3 to +5 V	-3 to +5 V	-3 to +5 V	-3 to +5 V	0 to 20 V	0 to 20 V	0 to 40 V
• Frequency		—	—	—	—	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz
Isolation (to backplane bus)		Optocoupler	Optocoupler	Optocoupler	Optocoupler	Optocoupler	Optocoupler	Optocoupler
• In groups of		16	16	32	16	4	8	2
Input current								
• for "1" signal	typ.	7.0 mA	7.0 mA	7 mA	7 mA	6 mA	21 mA	6.5 mA (120 V) 11 mA (230 V)
Input delay								
• Configurable		—	—	—	0.1/0.5/3/15/20 ms ²⁾	—	—	—
• At rated input voltage		1.2 to 4.8 ms	1.2 to 4.8 ms	1.2 to 4.8 ms	—	25 ms	25 ms	25 ms
No. of inputs that can be addressed simultaneously								
• Up to 40 °C		16	16	32	16	16	32	8
• Up to 60 °C		16	16	16	16	16	24	8
Connection of 2-wire BERO		Possible	Possible	Possible	Possible	Possible	Possible	Possible
• Permissible quiescent current	max.	1.5 mA	1.5 mA	1.5 mA	1.5 mA	1 mA	4 mA	2 mA
Cable length								
• Unshielded		600 m	600 m	600 m	600 m	600 m	600 m	600 m
• Shielded		1000 m	1000 m	1000 m	1000 m	1000 m	1000 m	1000 m
Interrupts		—	—	—	Yes	—	—	—
Diagnostics		—	—	—	Yes	—	—	—
Power consumption								
• from backplane bus	max.	25 mA	10 mA	15 mA	55 mA	16 mA	16 mA	29 mA
• from L+	max.	25 mA	—	—	40 mA	—	—	—
Power loss	typ.	3.5 W	3.5 W	6.5 W	4 W	4.1 W	4.0 W	4.9 W
Insulation (tested at)		500 V DC	500 V DC	500 V DC	500 V DC	1500 V AC	1500 V AC	1500 V AC
Dimensions (W x H x D) in mm		40x125x120	40x125x120	40x125x120	40x125x120	40x125x120	40x125x120	40x125x120
Weight	approx.	200 g	200 g	260 g	200 g	225 g	300 g	240 g

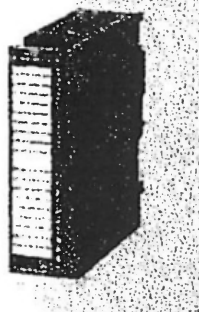
1) With extended temperature range

2) An additional conditioning time of 0.25 ms must be added before the signal can be transmitted on the backplane bus

SIMATIC S7-300

Digital input/output modules

Overview



- Digital outputs for the SIMATIC S7-300
- For connecting solenoid valves, contactors, small-power motors, lamps and motor starters

Application

Digital output modules convert the internal signal level of the S7-300 to the external signal level required for the process.

They are suitable for connecting solenoid valves, contactors, small-power motors, lamps and motor starters.

Technical specifications

SM 322	6ES7 322-	1BH01-0AA0 1BH01-0AA0U	1BL00-0AA0	6BF00-0AB0	1BF01-0AA0	1FF01-0AA0 1FF01-0AA0U
Number of outputs		16	32	8	8	8
Rated load voltage L+/L1		24 V DC	24 V DC	24 V DC	24 V DC	120 V/230 V AC
• Permissible range		20.4 to 28.8 V	20.4 to 28.8 V	20.4 to 28.8 V	20.4 to 28.8 V	93 to 132 V/ 187 to 264 V
Output voltage						
• for "1" signal		L+ - 0.8 V	L+ - 0.8 V	L+ - 0.8 V up to - 1.6 V	L+ - 0.8 V	L1 - 15 V
Optical isolation to backplane bus						
• in groups of		Optocoupler 8	Optocoupler 8	Optocoupler 8	Optocoupler 4	Optocoupler 4
Output current						
• for "1" signal						
Rated value at 60 °C		0.5 A	0.5 A	0.5 A	2 A	1 A
Minimum current min.		5 mA	5 mA	10 mA	5 mA	10 mA
• for "0" signal		0.5 mA	0.5 mA	0.5 mA	0.5 mA	2 mA
Sum of output currents (per group)						
• up to 60 °C (horizontal installation)		2 A	2 A	2 A	4 A	2 A
Lamp load max.		5 W	5 W	5 W	10 W	50 W
Switching frequency of contacts						
• Resistive loads max.		100 Hz	100 Hz	100 Hz	100 Hz	10 Hz
• Inductive loads max.		0.5 Hz	0.5 Hz	2 Hz	0.5 Hz	0.5 Hz
• Lamp loads max.		100 Hz	100 Hz	10 Hz	100 Hz	1 Hz
• Mechanical max.		—	—	—	—	—
Switching capacity of contacts						
• Resistive loads max.		—	—	—	—	—
• Inductive loads/lamp loads max.		—	—	—	—	—
Service life of contacts per VDE 0660, Part 200						
• AC 15		—	—	—	—	—
• DC 13		—	—	—	—	—
Inductive cutoff voltage limited to		L+ - 48 V	L+ - 48 V	L+ - 45 V	L+ - 48 V	—
Short-circuit protection		Electronic	Electronic	Electronic	Electronic	Fuse

1) With extended temperature range

SIMATIC S7-300

Digital input/output modules

SM 322 digital output module 4x16-bit

Technical specifications (continued)

SM 322	6ES7 322-	1BH01-0AA0	1BL00-0AA0	1BF00-0AB00	1BF01-0AA0	1FF01-0AA0
Cable length						
• Unshielded		600 m	600 m	600 m	600 m	600 m
• Shielded		1000 m	1000 m	1000 m	1000 m	1000 m
Interrupts		—	—	Yes	—	—
Diagnostics		—	—	Parameterizable: Diagnostics interrupt channel-by-channel, short-circuit, wirebreak, missing load voltage	—	Red LED for fuse or no L1/N
Power consumption						
• from backplane bus max.		80 mA	90 mA	70 mA	40 mA	100 mA
• from L+/L1 max. (without load)		120 mA	200 mA	90 mA	60 mA	2 mA
Supply voltage L+/ current consumption of the relays		—	—	—	—	—
Power loss typ.		4.9 W	5 W	5 W	6.8 W	8.6 W
Insulation, tested with		500 V DC	500 V DC	600 V DC	500 V DC	1500 V AC
Dimensions (W x H x D) in mm		40x125x120	40x125x120	40x125x120	40x125x120	40x125x120
Weight approx.		190 g	210 g	210 g	190 g	275 g

1) With extended temperature range

2) At CPU Stop, the module can maintain the last value (byte) or switch a replacement value (byte) to the outputs.
Diagnostics via CPU evaluation and LED color change from green to red

Technical specifications (continued)

SM 322	6ES7 322-	1EH01-0AA0	1EL00-0AA0	1HF01-0AA0	1HH10-0AA0	1HH00-0AA0
Number of outputs		16	32	8	8	16
Rated load voltage L+/L1		120 V AC	120 V AC	AC to 230 V 24 V DC	AC to 230 V DC to 120 V	AC to 120 V 24 V DC
• Permissible range		93 to 132 V	93 to 132 V	—	—	—
Output voltage						
• for "1" signal		L1 - 1.5 V	L1 - 1.5 V	—	—	—
Isolation						
to backplane bus		Optocoupler	Optocoupler	Optocoupler	Optocoupler	Optocoupler
• in groups of		8	8	2	1	8
Output current						
• for "1" signal						
Rated value at 60 °C		0.5 A	1 A	—	—	—
Minimum current min.		10 mA	10 mA	—	—	—
• for "0" signal		1 mA	3 mA	—	—	—
Sum of output currents (per group)						
• up to 60 °C (horizontal installation)		2 A	3 A	—	—	—
Lamp load max.		25 W	25 W	—	—	—
Switching frequency of contacts						
• Resistive loads max.		10 Hz	10 Hz	2 Hz	2 Hz	12 Hz
• Inductive loads max.		0.5 Hz	0.5 Hz	0.5 Hz	0.5 Hz	0.5 Hz
• Lamp load max.		1 Hz	1 Hz	2 Hz	2 Hz	2 Hz
• Mechanical max.		—	—	10 Hz	10 Hz	10 Hz
Switching capacity of contacts						
• Resistive loads max.		—	—	2 A (230 V AC), 2 A (24 V DC)	8 A (230 V AC), 8 A (24 V DC)	2 A (120 V AC), 2 A (24 V DC)
• Inductive loads/ max.		—	—	2 A (230 V AC), 2 A (24 V DC)	2 A (230 V AC), 3 A (24 V DC)	2 A (120 V AC), 2 A (24 V DC)
• Lamp load		—	—	—	—	—

SM 322 digital output modules control all

100

Ordering data

Front connector (1 pc)

- 20-pin, with screw-type contacts
- 20-pin, with spring-loaded terminals
- 40-pin, with screw-type contacts
- 40-pin, with spring-loaded terminals

6E87 322-1BH01-0A00
6E87 322-1BH01-0A00
6E87 322-1BL00-0A00
6E87 322-8BF00-0AB0
6E87 322-1EH01-0A00
6E87 322-1EL00-0A00
6E87 322-1BF01-0A00
6E87 322-1FF01-0A00
6E87 322-1FF01-0A00

6E57 322-1HF01-QAAG
6E57 322-1HF10-QAAG
6E57 322-1HH00-QAAG

6EST 392-1AJ00-0AA0
6EST 392-1BJ00-0AA0

6E57 392-1AM00-QAA0
6E57 392-1BM01-QAA0

Labeling cover
(10 pcs , spare part)

- for signal modules (except 32-channel modules), function modules and CPU 312 IFM
- for 32-channel signal modules

SIMATIC TOP Connect
Bus connector 1 pc. (spare part)

Labeling strips
(10 pcs.)

- for signal modules (except 32-channel modules), function modules and CPU 312 IFM
- for 32-channel signal modules

Fuse for SM 322
1 set (spare part)
10 fuses, 8 A fast-action and
2 fuse holders

6E87392-2XY00-0A00

BE97392-2XY10-0AA0

See page 5/106

6E87 390 QAA00-QAA0

6E57 392-20X00-0A00

6ES7 392-2XX10-0AA0

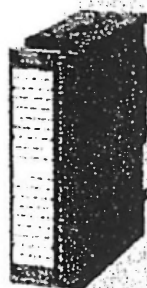
8E57 973-1HD00-QAA0

SIMATIC S7-300

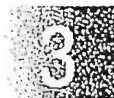
Analog input/output modules

SM 331 analog input modules

Overview



- Analog inputs for the SIMATIC S7-300
- For connecting voltage and current sensors, thermocouples, resistors and resistance thermometers



Application

Analog input modules convert analog signals from the process to digital signals for internal processing within the S7-300

Voltage and current sensors, thermocouples, resistors and resistance thermometers can be connected as sensors.

Function

Features also include:

- Configurable resolution from 9 to 15 bits + sign (for different conversion times)

- A variety of measuring ranges: The basic current/voltage measuring ranges are set mechanically with range cards; fine adjustment is made with the STEP 7 "Hardware Configuration" function on a programming device

- Interrupt capability: The module transmits diagnostic and limit value interrupts to the programmable controller's CPU
- Diagnostics: The module sends extensive diagnostic information to the CPU

Technical specifications

SM 331	6ES7 331-	7KF01-0AB0	7KB01-0AB0 / 7KB81-0AB0 ¹⁾	7NF01-0AB0
Number of inputs		8	2	8
• for resistance measurements		4	1	—
Rated load voltage L+		24 V DC	24 V DC	—
• Polarity reversal protection		Yes	Yes	—
Input ranges/ input resistance				
• Voltage		± 80 mV/10 Mohms ± 250 mV/10 Mohms ± 500 mV/10 Mohms ± 1 V/10 Mohms ± 2.5 V/100 kohms ± 5 V/100 Mohms 1 to 5 V/100 Mohms ± 10 V/100 Mohms	± 80 mV/10 Mohms ± 250 mV/10 Mohms ± 500 mV/10 Mohms ± 1 V/10 Mohms ± 2.5 V/100 kohms ± 5 V/100 Mohms 1 to 5 V/100 Mohms ± 10 V/100 Mohms	± 5 mV/2 Mohms 1 to 5 V/2 Mohms ± 10 V/2 Mohms
• Current		± 10 mA/25 ohms ± 3.2 mA/25 ohms ± 20 mA/25 ohms 0 to 20 mA/25 ohms 4 to 20 mA/25 ohms	± 10 mA/25 ohms ± 3.2 mA/25 ohms ± 20 mA/25 ohms 0 to 20 mA/25 ohms 4 to 20 mA/25 ohms	± 20 mA/250 ohms 0 to 20 mA/250 ohms 4 to 20 mA/250 ohms
• Resistance		150 ohms/10 Mohms 300 ohms/10 Mohms 600 ohms/10 Mohms	150 ohms/10 Mohms 300 ohms/10 Mohms 600 ohms/10 Mohms	—
• Thermocouples		Type E, N, J, K/10 Mohms	Type E, N, J, K/10 Mohms	—
• Resistance thermometers		Pt 100 standard/ 10 Mohms Ni 100 standard	Pt 100 standard/ 10 Mohms Ni 100 standard	—
Permissible input voltage for voltage input	max.	20 V	20 V	50 V
Permissible input current for current input	max.	40 mA	40 mA	32 mA

1) With extended temperature range

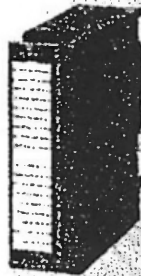


SIMATIC S7-300

Analog input/output modules

SM 332 Analog output module

Overview



- Analog outputs for SIMATIC S7-300
- For connecting analog actuators

Application

Analog output modules convert digital signals from the S7-300 to analog signals for the process.

Function

Features also include:

- Resolution 12 to 15 bits
- A variety of voltage and current ranges:
Ranges are set independently for each channel by means of parameterization software.

- Interrupt capability:
The module transmits diagnostic and limit value interrupts to the programmable controller's CPU on occurrence of errors
- Diagnostics:
The module sends extensive diagnostic information to the CPU

Technical specifications

SM 332	6ES7 332-	SH-D1-0AB0	SH-D1-0AB0	SH-D1-0AB0
Number of outputs		4	2	4
Rated load voltage		24 V DC	24 V DC	24 V DC
Output ranges				
• Voltage outputs		0 to 10 V; ± 10 V; 1 to 5 V	0 to 10 V; ± 10 V; 1 to 5 V	0 to 10 V; ± 10 V; 1 to 5 V
• Current outputs		4 to 20 mA; ± 20 mA; 0 to 20 mA	4 to 20 mA; ± 20 mA; 0 to 20 mA	4 to 20 mA; ± 20 mA; 0 to 20 mA
Load impedance				
• Voltage outputs	max.	1 kohms	1 kohms	1 kohms
• Current outputs	max.	0.5 kohms	0.5 kohms	0.5 kohms
• Capacitive loads	max.	1 μ F	1 μ F	1 μ F
• Inductive loads	max.	1 mH	1 mH	1 mH
Voltage output				
• Short-circuit protection		Yes	Yes	Yes
• Short-circuit current	max.	25 mA	25 mA	40 mA
Power output				
• Open-circuit current	max.	18 V	18 V	18 V
Optical isolation to backplane bus		Yes	Yes	Yes
Resolution		11 bits + sign (at ± 10 V, ± 20 mA, 4 to 20 mA, 1 to 5 V); 12 bits at 0 to 10 V, to 20 mA)	11 bits + sign (at ± 10 V, ± 20 mA, 4 to 20 mA, 1 to 5 V); 12 bits at 0 to 10 V, to 20 mA)	15 bits + sign
Conversion time per channel	max.	0.8 ms	0.8 ms	1.5 ms
Settling time				
• Resistive loads		0.1 ms	0.1 ms	0.2 ms
• Capacitive loads		3.3 ms	3.3 ms	0.5 ms
• Inductive loads		0.5 ms	0.5 ms	0.5 ms
Substitute values		Configurable	Configurable	Configurable

1) With extended temperature range



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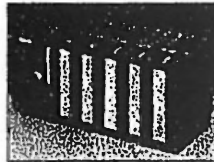
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SIMATIC® S7-300™ PLC

Software

STEP 7 is more than a PLC programming software package

STEP 7 is not simply a PLC programming software package. Saying that it is would be a misrepresentation. Certainly, STEP 7 provides for PLC programming. In fact, at least three programming options are built-in to handle this one task, with several other programming language options available. However, the Programming Editor is only one part of the STEP 7 development and engineering tool suite.

STEP 7 provides a collection of components that provide the tools to plan, configure, develop, test, troubleshoot, document and support not only PLC programs, but also entire automation projects.

Remote access via modem and the Internet

There is no need to be locally connected to your automation station or network to program, make updates, or troubleshoot. The STEP 7 TeleService package enables you to connect a programming device or a PC to a SIMATIC® PLC via the telephone network or via Internet. This enables you to manage, control and monitor remote machines or plants from a central point saving the cost of travel and extended downtime.

Diagnostics and Interrupt Capabilities

The CPU interrogates itself and its connections in every scan, whether you have a program or not. This means that you do not have to write diagnostic logic to find out what is wrong with your hardware or software. And at the moment the CPU and its operating system find a problem, an interrupt occurs and the CPU gives an interrupt block all the information about the error. In this block, you can write code to react as you choose to the error, such as shut down the PLC, send the error information to an operator station or log the error in a database. With this capability, a troubleshoot technician can see a picture on an operator panel or a text message that simply states the cause of the error, without even having to go Online. And in case you don't want to write this diagnostics code with the error handling, other STEP 7 options called PDIAG/ProAgent and operator interface software of WinCC / ProTool manages all of this

S7-300 Ir

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S7-300 S

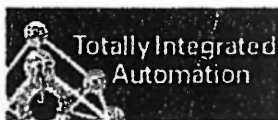
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programming and error identification for you.

Multi language support

To translate projects into other national languages, you can export texts of the project and you can edit these texts outside of STEP 7 with an ASCII editor or a table-editing tool. You can then import the texts back into STEP 7 and maintain the correct placement within the program. (The format of the export file is csv: comma separated value.)

Open command interface

You can use the command interface to access STEP 7 functions that presently can be executed only with an interface for applications that you programmed yourself. The command interface is an OLE automation interface through which selected objects (some configuration tools within the command interface) and functions of STEP 7 can be addressed. You can use the command interface with any OLE script languages with automation capability or programming languages such as Visual Basic® Version 5 or higher, Visual C++, or Visual J++.

Support of different networking and bus systems

MPI, the low-cost network for small amounts of data

Every S7-300 and S7-400 CPU is equipped with the Siemens Multi-Point Interface (MPI) connection. This is both a programming and peer-to-peer networking connection. This interface establishes a subnet in which CPU's, user interface and programming devices can simultaneously exchange data with each other.

PROFIBUS (DP), high-speed exchange of small and medium amounts of data

There are protocols for different communication layers in the open PROFIBUS standard. PROFIBUS DP is commonly used to transfer the data between master and slaves for the Decentralized Periphery (remote devices) such as SIMATIC® S7 slaves or even non-Siemens PROFIBUS compatible devices. PROFIBUS DP protocol is deterministic, meaning it is possible to support more than one network on the same cable at the same time.

Industrial Ethernet, high-speed exchange of large amounts of data

Industrial Ethernet is the subnet used for connection of computer and programmable controllers and is commonly used for industrial application, or the connection to the Intra-, Internet. With the support of baud rates up to 100MHz, Ethernet is often the choice for data collection to enhance throughput.

Point-to-Point coupling, the serial link with special protocols

A point-to-point connection uses a serial connection to handle the data exchange. STEP 7 and the SIMATIC® Manager treats a point-to-point coupling as a subnet.

AS-Interface, robust low-cost networking at the lowest level